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INFLUENCE OF PARENTAL SUBSTANCE ABUSE ON SUBSTANCE USE AND
PSYCHIATRIC SEVERITY IN DRUG-DEPENDENT PREGNANT WOMEN

A Thesis submitted in partial fulfillment of the requirements for the degree of Master of
Science at Virginia Commonwealth University.

by

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Abstract

INFLUENCE OF PARENTAL SUBSTANCE ABUSE ON SUBSTANCE USE AND PSYCHIATRIC SEVERITY IN DRUG-DEPENDENT PREGNANT WOMEN

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The purpose of this study was to examine the relationship between history of parental substance abuse and substance use and psychiatric severity measures in a sample of treatment-seeking, pregnant women who meet DSM-III-R criteria for lifetime opioid and cocaine abuse and/or dependence (N=260). The study examined whether a dose-response relationship was observed between number of parents affected by substance use problems (0, 1, and 2) and degree of women's substance use and psychiatric severity. Results did not support a dose-response relationship between density of parental problems and

substance use and psychiatric severity. However, some differences in severity were seen at different levels and types of parental density. Overall, the present study supports the need to further examine parental history of substance abuse as a potential risk factor for more severe substance use and psychiatric problems. Study findings have important implications for the screening and treatment of substance dependence during pregnancy.

Introduction

Substance use disorders (SUDs) affect a significant proportion of individuals each year (SAMSHA, 2007; Hasin et al., 2007; Compton et al., 2007; Kessler et al., 2005a; Kessler et al., 2005b). Within the population of substance users are pregnant women, who, despite the negative effects of substance use on the fetus, continue to use during pregnancy (Bailey et al., 2008). Conservative estimates suggest that over one-tenth of pregnant women have consumed alcohol in the past month and 4% have used illicit drugs in the past month (SAMSHA, 2007). To complicate this clinical picture, substance-using pregnant women, especially those in treatment, are also likely to experience other psychiatric problems (Hans, 1999; Horrigan et al., 2000).

Past studies have provided strong evidence that substance use problems tend to run in families, suggesting a family history of substance use problems is a significant risk factor for the development of substance use disorders (Chassin et al., 1991; Rounsaville et al., 1991; Merikangas et al., 1998b; Bierut et al., 1998). Different methodologies have been utilized to further examine this transmission and to disentangle genetic and environmental factors. Findings from adoption and twin studies support of role of both genetic and environmental influences in the transmission of substance use disorders (Cadoret et al., 1986; Tsuang et al., 1998; Newlin et al., 2000; Kendler, 2001). Although familial transmission of substance use disorders has been studied extensively, much

remains unknown or blurred by mixed findings. For instance, many studies have focused exclusively on alcoholism (Cotton, 1979; Cloninger et al., 1988; Kendler et al., 1997), so it is unclear how family history may also influence the development of drug use disorders. Further, mixed findings exist regarding whether individuals with a family history of substance problems have more severe substance use disorders (Stabenau, 1990; Boyd et al., 1999; Pickens et al., 2001; Coviello et al., 2004) and psychiatric symptomatology (Dawson & Grant, 1996; Nurnberger et al., 2004) than individuals with no family history.

The influence of family history of substance use problems on problems in offspring has only recently been examined in pregnant women (Pickens et al., 2001; Savage & Wray, 2004; Derauf et al., 2007). These studies provide preliminary support for the influence of family members' substance use on women's use during pregnancy; however, this relationship was not observed consistently. Further research is warranted in order to identify possible risk factors (i.e., maternal and/or paternal alcohol and/or drug problems) of more severe substance use or greater psychiatric problems. Identification of such risk factors would be helpful in screening for high-risk women in such settings as Obstetric (OB) clinics and in identifying women at treatment entry who may benefit from additional services.

The purpose of the proposed study is to examine the relationship between history of parental substance abuse and both substance use and psychiatric severity measures in a sample of treatment-seeking, pregnant women who meet DSM-III-R criteria for lifetime opioid and/or cocaine abuse/dependence. First, a review of the family history literature is presented with an emphasis on how family history is measured and what relationships

between family history and offspring psychopathology may exist. Then, the following aims of the study are elaborated: 1) to summarize the incidence of parental substance problems (maternal and paternal alcohol and drug problems, parental alcohol problems, and parental drug problems) among participants and describe their substance use and psychiatric severity; 2) to examine proband substance use and psychiatric symptom severity in those with a history of 0, 1 or both parents affected by alcohol problems; and 3) to examine proband substance use and psychiatric symptom severity in those with a history of 0, 1 or both parents affected by drug problems. For significant family history and severity relationships, two additional specific aims were to further examine proband substance use and psychiatric severity measures in: 4) those with and without a paternal history of alcohol or drug problems; and 5) those with and without a maternal history of alcohol or drug problems.

Hypotheses for the second and third specific aims posit a dose-response relationship between number of parents affected by substance use: 1) For parental alcohol problems, probands with neither parent affected will have the lowest severity problems, followed by those with one parent affected, and finally those with both parents having problems; 2) For parental drug problems, probands with neither parent affected will have the lowest severity problems, followed by those with one parent affected, and finally those with both parents having problems. The hypotheses for the fourth and fifth specific aim are as follows: 3) For paternal alcohol and drug problems, probands with a positive history (e.g., having a father with alcohol problems) will be more likely to have more severe substance abuse and psychiatric symptoms than probands without such history; and 4) For

maternal alcohol and drug problems, probands with a positive history (e.g., having a mother with alcohol problems) will be more likely to have more severe substance abuse and psychiatric symptoms than probands without such history.

Review of the Literature

Substance Use Disorders

Diagnosis of Substance Use Disorders

Substance use has been a part of society for centuries (Westermeyer, 2005). Likewise, problematic substance use has a long history dating back to before the 17th century (Westermeyer, 2005). The Diagnostic and Statistical Manual of Mental Disorders first conceptualized substance use problems as sociopathic personality disturbances in DSM-I and then later classified them among personality disorders and sexual deviations in DSM-II (Nathan, Skinstad, Langenbucher, 1999). In DSM-III and DSM-III-R, substance use disorders (SUD) were not only separated from personality disorders, but the symptoms and consequences of problematic or excessive use were formalized and separated into two distinct disorders: Substance Abuse and Substance Dependence. Specifically, Substance Abuse was viewed as a less severe disorder than Substance Dependence. DSM-IV further refined the criteria for Substance Abuse and Dependence such that Substance Dependence criteria take priority, and are examined first. Then, only if an individual does not meet these criteria, is a diagnosis of Substance Abuse considered. Text revisions were subsequently made to DSM-IV in 2000 to reflect new empirical evidence and correct any factual errors; however no significant changes were made to formal diagnostic criteria (APA, 2000).

Although diagnostic criteria for SUDs were revised from DSM-III-R to DSM-IV, the changes were not substantive. They included: 1) the addition of qualifiers of “with or without physiological dependence” to the disorder of Substance Dependence; and 2) moving the criterion of social and occupational consequences of substance use from Substance Dependence to Substance Abuse. Specific criteria for the DSM-IV-TR Substance Dependence and Substance Abuse diagnoses are summarized below (APA, 2000).

Substance Dependence. Substance Dependence is conceptualized as a combination of cognitive, behavioral, and physiological symptoms that persist despite significant problems related to substance use. According to the DSM-IV-TR, Substance Dependence is a maladaptive pattern of substance use which leads to clinically significant impairment or distress, involving at least three of the following: 1) tolerance, as defined by either a need for markedly increased amounts of the substance to achieve intoxication or desired effect or markedly diminished effect with continued use of the same amount of the substance; 2) withdrawal, as indicated by either the characteristic withdrawal syndrome for the specific substance or the same or similar substance taken to relieve or avoid withdrawal symptoms; 3) the substance is usually taken in large amounts or over a longer period of time than was intended; 4) there is a persistent desire or unsuccessful efforts to cut down or control substance use; 5) a great amount of time is spent in activities necessary to obtain the substance; 6) important social, occupational, or recreational activities are given up or decreased because of substance use; 7) use is continued despite knowledge of having a persistent physical or psychological problems that is likely to have been caused or

worsened by the substance (APA, 2000). These symptoms must occur together within the same 12-month period. Report of one of these symptoms in the past 12 months would indicate current Substance Dependence while report not in the past year would indicate lifetime Substance Dependence.

Substance Abuse. In DSM-IV-TR, a diagnosis of Substance Abuse is considered only when an individual does not meet criteria for Substance Dependence (APA, 2000). Substance Dependence is generally viewed as a more severe disorder than Substance Abuse because the constellation of potential symptoms includes tolerance, withdrawal and/or a compulsive pattern of use. Like Substance Dependence, however, a diagnosis of Substance Abuse also requires a maladaptive pattern of use resulting in clinically significant impairment or distress. To receive a DSM-IV-TR Substance Abuse diagnosis, the individual must report at least one of the following symptoms: 1) persistent substance use resulting in failure to fulfill major role obligations at school, work, or home; 2) persistent substance use in physically hazardous situations; 3) recurrent substance-related legal problems; 4) continued use despite recurrent social or interpersonal problems resulting from or intensified by the effects of the substance. Report of one of these symptoms in the past 12 months would indicate current Substance Abuse while report not in the past year would indicate lifetime Substance Abuse.

Prevalence of Substance Use Disorders

General Population. Substance use is common in the general U.S. population. Recently, the Substance Abuse and Mental Health Services Administration (SAMHSA) conducted the 2006 National Survey on Drug Use and Health (NSDUH). A representative

sample of the population, consisting of over 67,500 individuals aged 12 and older, were interviewed at their place of residence. The results of the NSDUH indicated that 6.9% of the U.S. population or 17 million people reported heavy drinking, and 8.3% of the population or 20.4 million Americans used an illicit drug in the month prior to the interview. Heavy drinking was defined as having five or more drinks on the same occasion on at least 5 days in the last 30 days. In addition, about 29.6% or 72.9 million Americans used a tobacco product in the past month.

The 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC; Hasin et al., 2007; Compton et al., 2007) also provided U.S. population data on substance use and substance use disorders. Both twelve-month and lifetime prevalence estimates were obtained for individuals (N = 43,093) aged 18 and older using face-to-face interviews with DSM-IV diagnostic criteria. Over 30.3% of the population met criteria for lifetime Alcohol Use Disorders (AUD; Abuse and/or Dependence), while 8.5% met criteria for an Alcohol Use Disorder in the 12 months prior to the interview. Prevalence rates of Drug Use Disorders were lower with 10% of the population meeting lifetime criteria and 2% of the population meeting criteria in the past 12-months.

In an effort to replicate the National Comorbidity Survey (NCS), the NCS Replication survey was carried out during 2001 and 2002 (NCS-R). A representative sample of the U.S. population (N = 10, 000) aged 18 and older were administered face-to-face fully-structured diagnostic interviews using the Structured Clinical Interview (SCID) for DSM-IV Axis I Disorders. Findings included lower prevalence rates for both lifetime (Kessler et al., 2005a) and past 12-month diagnoses of SUDs (Kessler et al., 2005b)

compared to the NESARC. According to the NCS-R, 13.2% of the sample met criteria for lifetime alcohol use disorder (AUD), while 3.1% met criteria in the past 12 months.

Similar to NESARC findings, the prevalence of drug use disorders was lower than that of AUDs, with 8% of the sample meeting lifetime criteria and 1.4% of the sample meeting criteria for a current diagnosis (past 12 months).

Gender Differences. Prevalence of substance use and substance use disorders in the population varies by gender. Men are more likely than women to use substances and to meet criteria for a substance use disorder. Based on population estimates of individuals 12 and older, 57% of males and 45.2% of females had consumed at least one alcoholic drink in the past 30 days (SAMHSA, 2007). Prevalence rates for Alcohol Use Disorders were over twice as high for males than females for both lifetime (42% vs. 19.5%) and past 12-months criteria (12.4% vs. 4.9%; Compton et al., 2007). Similar patterns within the population exist for drug use. Males reported illicit drug use in the past month more frequently (10.5%) than females (6.2%). In addition, males were more frequently diagnosed with SUDs than females. This was true for both lifetime (13.8% vs. 7.1%) and recent (past year) (2.8% vs. 1.2%) SUDs. Current (past month) use of a tobacco product was also more common among males than females (36.4% vs. 23.3%).

Pregnant Women. Although many women reduce or stop substance use during pregnancy (SAMHSA, 2007), a significant proportion continue to use substances during the prenatal period (Bailey et al., 2008). With the NSDUH data, it is important to recognize that these are conservative estimates as the surveys focused only on the past 30 days rather than the entire prenatal period. Of the pregnant women interviewed, aged 15 to

44 years, 11.8% reported current (past month) alcohol use, 2.9% reported binge drinking (five or more drinks on the same occasion on at least one day in the past month), 0.7% reported heavy drinking, and 16.5% reported cigarette use in the month prior to being interviewed. Illicit drug use prevalence was lower with 4% of pregnant women reporting use of a drug in the past month. In addition to conservative estimates based on NSDUH data, studies have consistently found pregnant women underreport substance use due to the social stigma and fear of legal consequences (Ondersma et al. 2000, 2001).

Family History of Alcohol and Drug Problems

The idea that substance use disorders tend to run in families is not new to either the alcohol (Goodwin, 1971; Cotton, 1979; Pollack et al., 1987; Merikangas, 1990; Kendler et al., 1997; Hill & Yuan, 1999; Hill et al., 2000; Lieb et al., 2002) or drug literature (Rounsaville et al., 1991; Luthar et al., 1993; Miles et al., 1998; Merikangas et al., 1998; Kendler et al., 1999; Compton et al., 2002; Hoffman & Cerbone, 2002). In order to investigate the familial transmission of substance use disorders, investigators have compared rates of the disorder among relatives of affected individuals (probands) to relatives of unaffected individuals (controls). Higher prevalence rates of a disorder among relatives of probands than relatives of controls suggest SUDs follow a familial pattern of transmission.

Incidence of Family History

Alcohol. Throughout the past four decades, numerous studies have found that a family history of alcoholism is more common among individuals with alcohol problems than individuals with no alcohol problems (Cotton, 1979; Cloninger et al., 1988; Kendler

et al., 1997; Bidat-Russell et al., 1994; Merikangas et al., 1998b; Hill & Yuan, 1999; Nurnberger et al., 2004). As a result of this strong association, family history of AUD is considered a risk factor for developing alcohol problem. Based on a nationwide survey of the U.S. population aged 15-54 (National Comorbidity Survey; Kendler et al., 1997), alcohol abuse and dependence was significantly more common in parents of probands with AUD than in parents of controls (17.8% vs. 10.1%). Similar results were found in a national study of alcoholism: first-degree relatives of alcoholics were twice as likely to be alcohol dependent than relatives of non-alcoholics (Nurnberger et al., 2004). Offspring with a family history of alcoholism may also be more likely to abuse other substances and become dependent on them than offspring with no family history of alcoholism (Chassin et al., 1991; Merikangas et al., 1998b).

Other Drugs. It is likely that other substance use disorders follow a similar pattern of transmission as a family history of drug problems (excluding alcohol) has also been found to be a significant risk factor for development of drug use disorders in offspring (Rounsaville et al., 1991; Bierut et al., 1998; Merikangas et al., 1998b). Relatives of individuals with a SUD are more likely to experience a SUD themselves than relatives of unaffected individuals (Merikangas et al., 1998b; Miles et al., 1998; Hoffman & Cerbone, 2002; Office of Applied Studies, 2005). For instance, Merikangas and colleagues (1998b) found higher rates among individuals with a drug use disorder even after controlling for demographic and clinical confounds: relatives of probands were 8 times more likely to have a drug disorder than relatives of controls.

Methodology

Family Method. In order to investigate if and how SUDs cluster within families, researchers have relied on the family method, which focuses on families or particular family members with a known history of substance misuse (Walters, 2002). Specifically, two methods are used to obtain information on family members: the family study method and family history method. The family history method obtains information from a single family member, a proband or affected individual, concerning all family members. In contrast, the family study method involves directly interviewing all family members or as many as possible to obtain information (Andreasen et al., 1977). This method is costly and often is not practical, but is typically viewed as more valid by researchers (Rice et al., 1995). However, research comparing the two methods has found the family history method to be a valid source of information with high specificity (96-98%), the probability of a positive history diagnosis in an individual with a positive interview diagnosis, and moderate sensitivity (39-52%), the probability of a negative history in an individual with a negative interview diagnosis (Andreasen et al., 1986; Rice et al., 1995).

Given the immense cost and time associated with the family study method and evidence for the validity of the family history method, recent studies have utilized the history method in order to obtain family information. Most studies have relied on the family history method despite the view of the direct interview as the “gold standard” (Rice et al., 1995), through the use of a single question regarding parental psychopathology (Cuijpers & Smit, 2001) or measures such as the Family History- Research Diagnostic Criteria (FH-RDC; Andreasen et al., 1977), the Family Alcohol and Drug Survey (FADS;

Pickens et al., 1991) derived from the FH-RDC, the Semi-Structured Assessment for the Genetics of Alcoholism (SSAGA) derived from the National Institutes of Mental Health Diagnostic Interview Schedule (DIS; Helzer & Robbins, 1988), and the Addiction Severity Index Family History Module (ASI; McLellan et al., 1992).

Despite the use of similar family history methods, family history of SUDs can be conceptualized in a variety of ways. Different criteria have been used to determine whether an individual has a positive or negative family history. For instance, an individual could be determined to have a positive family history of SUD based on if they had a family member in treatment (Ohannessian & Hesselbrock, 1999), their responses during a structured interview (Merikangas et al., 1998a), or their response to a single question (Pickens et al., 2001). Further, a classification of family history varies by the type of relatives (first-degree biological relatives versus first- and second-degree relatives) included. Some investigators have chosen to focus on first- and second-degree relatives (Dawson & Grant, 1998), while others have only included first-degree relatives (Sbrana et al., 2007; Miles et al., 1998) or parents only (Sannibale & Hall, 2001; Boyd et al., 1999; Westermeyer et al., 2007; Pickens et al., 2001; Cuijpers & Smit, 2001) in making a determination of family history positive or negative. First-degree relatives share 50% of their genes in common and include such relatives as parents, siblings, and children, whereas second-degree relatives share 25% of their genes in common and include grandparents, aunt, nephew, half-sibling. Additionally, some researchers have gone beyond a dichotomous categorization) of family history (i.e., positive or negative) and have focused on density of family history. Even this construct has varied in definition,

with such definitions as the percentage of relatives identified with a SUD (Dawson & Grant, 1998), classification to a high, medium, or low familial risk group based on number of first- and second-degree relatives with an SUD (Coviello et al., 2004), and number of parents (neither, one, or both) with a SUD (Luthar et al., 1993; Lieb et al., 2002; Westermeyer et al., 2007).

Given the variability in how a positive family history has been defined, it is possible that the way in which family history is defined can influence study results. Two studies, drawing from the same population of treatment-seeking, heroin-dependent individuals in methadone maintenance treatment, exemplify how family history can be defined differently. Pickens and colleagues (2001) used the ASI Family History section to classify study participants as family history negative or positive depending on whether either parent was reported by the participant to have a drug or alcohol problem sufficient to warrant treatment. High agreement between the results of this ASI section and a separate family history assessment using direct interview methods of DSM-IV criteria were found. Study results indicated that participants with a positive family history first used heroin at an earlier age, had more symptoms of heroin dependence, and were more likely to be diagnosed with severe opiate dependence. In contrast, Coviello and colleagues (2004) used a more sensitive indicator of family history than Pickens et al. (2001) by categorizing family risk into three categories (high, medium, and low) using number of first- and second-degree biological relatives with a SUD based on the family history section of the Renard Diagnostic Interview (RDI; Helzer et al., 1981). However, similar results were found using a three-level classification and a two-level classification of either family

history negative or positive. Nonetheless, Coviello and others (2004) did not find the same relationship between family history and drug use severity as Pickens and colleagues (2001) even though both studies used samples of heroin-dependent individuals in methadone maintenance treatment.

Research methodology has also differed with respect to the types of probands studied. Probands, across a variety of different developmental stages including childhood and adolescence (Hill & Muka, 1996; Miles et al., 1998; Maes et al., 1999; McGue et al., 2000), and adulthood (Westermeyer et al., 2007), have been studied using the family method.

Findings from family method studies may support the transmission of SUDs from parent to offspring but they do not disentangle the influence of environmental and genetic factors on the etiology of these disorders. There are many ways in which genetics and the environment can affect an individual's development of SUD. Genetics has been found to influence not only a drug's metabolism, sensitivity, and side effects, but it also impacts an individual's cognitive and emotional functioning and personality (Khantzian, 1985; Weiss et al., 1992; Tsuang et al., 1996). The environment contributes through such mechanisms as exposure to drugs or increased drug availability (Khantzian, 1985; Weiss et al., 1992), stressful life events (Hoffman et al., 2000), family cohesion (Farrell et al., 1995), perceptions of quality of life, and legal difficulties (Derauf et al., 2007). Since families share both a common environment and common genes, different methodologies are needed to separate genetic effects from environmental effects (Walters, 2002). Two

methodologies which address confounds of family methods are twin and adoption methods.

Twin Method. The twin methodology compares concordance rates of SUDs of monozygotic (MZ) and dizygotic (DZ) twin pairs in order to examine the role of environmental and genetic factors on the development of the disorder. Because MZ twins are genetically identical and DZ twins only share half their genes in common, a genetic influence is assumed when MZ twins exhibit greater concordance for a behavior or trait than DZ twins (Walters, 2002). As a result, studies can estimate heritability or the proportion of variation in a trait among individuals in a population that can be attributed to genetic effects.

Kendler (2001), in a meta-analysis of population-based twin studies of alcoholism since 1992, found heritability estimates between 0.52 and 0.64. This suggests that over half of the variation in alcoholism in the population is attributable to genetic factors. Furthermore, because the range of heritabilities is fairly consistent, this proportion of variance appears to be fairly stable within the population (Kendler, 2001).

Heritability estimates for drug use disorders have also been examined. Two population-based twin registries, the Vietnam Era Twin Registry with male-male pairs (Tsuang et al., 1996, 1998) and Virginia Twin Registry (Kendler & Prescott, 1998a; Kendler & Prescott, 1998b; Kendler et al., 1999) with female-female pairs, have reported on the familial resemblance of illicit drug use and misuse. Tsuang and colleagues (1996, 1998) found a significant difference in the concordance rates of drug use disorders between MZ and DZ twins. The authors further reported both genetic (heritabilities ranged from

26% to 54%) and family environment factors (13% to 29%) have an effect on twin resemblance of drug abuse across a range of substances (Tsuang et al., 1998). Analysis of cannabis, cocaine, and stimulants in the Virginia Twin Registry (Kendler & Prescott, 1998a; Kendler & Prescott, 1998b; Kendler et al., 1999) revealed that twin resemblance for substance use was attributed equally to both genetic and environmental influences, while substance abuse and dependence was attributed solely to genetic factors with high heritability estimates (> 0.6). Together, these findings suggest both environmental and genetic factors influence the risk of substance misuse; however, the Virginia study suggests that family environment influences may be the strongest at drug initiation (Kendler, 2001).

Adoption method. Like the twin method, studies using the adoption method also help to distinguish between genetic and the environmental contributions to substance use disorders. The adoption method compares adoptees with a history of biological relatives with substance use problems to adoptees with no history of biological relatives with substance use problems. By doing so, the role of genetic and environmental influences can be estimated because biological parents are mainly responsible for the genetic component, whereas adoptive parents contribute only to the environmental component of a disorder. If rates of a disorder are higher among adoptees with a biological family history of substance use problems than adoptees with no such history, then a genetic influence is assumed.

The adoption method has been used to disentangle genetic and environmental influences in the transmission of alcohol use disorders. In an early study (Goodwin et al., 1973), male adoptees with and without a biological parent with alcoholism were compared

on symptoms of alcohol abuse and prevalence of alcoholism. Probands had significantly more alcohol abuse symptoms and had four times the rate of alcoholism compared to controls. Similar results were found with female adoptees (Bohman et al., 1981). More recent studies support the role of genetics in alcohol use disorders, specifically the link between alcoholism in a biological parent and alcohol dependence in offspring (Newlin et al., 2000; Yates et al., 1996). Using the adoption method, support for environmental effects, such as the rearing environment, has also been demonstrated (Cloninger, 1988, Cadoret et al., 1986).

Compared to alcohol use disorders, the adoption method has been used less frequently to study the etiological factors in drug use disorders. Studies utilizing this method have found support for both environmental and genetic factors in drug use disorders (Newlin et al., 2000; Cadoret, 1992). Additionally, investigators have examined the influence of alcohol problems in biological parents on offspring drug abuse and dependence using the adoption paradigm. Results suggest that adoptees from a biological parent with alcohol problems are at greater risk of developing drug abuse and may be genetically predisposed to transition from drug use to abuse compared to controls (Cadoret et al., 1986; Cadoret, 1992).

Other methodological issues. In studying the familial transmission of substance use disorders, researchers have chosen to focus on only alcoholism (Cuijpers & Smit, 2001; Nurnberger et al., 2004; Ohannessian & Hesselbrock, 1999; Sannibale & Hall, 2001; Pickens et al., 1991; Lieb et al., 2002), only drug use disorders (Luthar et al., 1993; Kendler & Prescott, 1998; Compton et al., 2002), and more recently, both alcohol and drug

use disorders (Merikangas et al., 1998b; Boyd et al., 1999; James & Adams, 2003; Westermeyer et al., 2007). While studies of alcoholism are fairly straightforward because they include only one type of substance (i.e., alcohol), studies of drug use face more complicated methodological questions as multiple types of drugs can be examined. Which type(s) of drugs should investigators focus on: all drugs, licit or illicit substances, or a specific class of drugs? This question is important to consider given differences in availability of drugs across geographic regions (Pach & Gorman, 2002; National Drug Intelligence Center, 2005) and the finding that drug availability affects drug initiation (Boys et al., 1999; Magura et al., 1991; Wallace & Bachman, 1991).

The decision to study or not to study certain classes of substances is also important because familial influences on substance use and misuse may be specific to certain substances, either individual substances or classes of substances (i.e., licit vs. illicit) (Merikangas et al., 1998b; McGue et al., 2000). In a study of substance dependent probands and controls (Merikangas et al., 1998b), a strong association between the predominant drug disorder in probands and the same predominant drug disorder in their relatives was found. Rates of opioid, cannabis, and alcohol dependence were highest among relatives of probands with a predominant drug disorder of opioid, cannabis, and alcohol dependence, respectively. Using the twin method with male-male pairs, Tsuang and colleagues (1998) found a significant family environmental influence for marijuana abuse that was specific to marijuana, however this specificity was not observed with other drugs (sedatives, stimulants, heroin or opiates, and psychedelics). These findings suggest that these drugs may share a similar vulnerability for abuse but the extent to which genetic

and environmental exert an influence varies by type of substance. Taken together, the results of some research points to the possibility of differences in heritability for illicit and licit drug use and abuse with greater heritability values observed for licit substances (Heath & Madden, 1995; Pickens et al., 1991; McGue et al., 2000) than illicit substances (Tsuang et al., 1996; McGue et al., 2000). McGue and colleagues posit that environmental influences may be of greater importance for illicit than licit substance misuse as an explanation of low heritability values for illicit substance abuse.

Family History and Substance Use Severity

Not only is a family history of substance use problems related to risk of SUD in offspring, but it may also be associated with higher severity of SUDs in these individuals. In a non-treatment sample of offspring of alcohol dependent parents and controls, a family history of alcohol problems was significantly associated with a more severe course of alcoholism (Stabenau, 1990). Further, offspring of parents with alcohol and drug problems are not only more likely to abuse alcohol and drugs, but also have significantly more severe problems than offspring with no parental history (Pickens et al., 2001; Boyd et al., 1999; Coviello et al., 2004). However, not all studies have supported this relationship. Sannibale and Hall (2001), in a mixed treatment and non-treatment sample of individuals with alcohol dependence, found that family history of alcohol problems was not predictive of AUD severity in a multiple regression model.

The relationship between family history and severity is further supported when age of onset is considered. Similar to other disorders (Klein et al., 1999; Sullivan et al., 1996), the earlier the age of onset, the more severe the course and the poorer the prognosis of

SUD (Sannibale & Hall, 2001; Babor et al., 1992). In addition, an earlier age of onset of substance use has also been associated with increased risk of substance use problems in adulthood (Anthony & Petronis, 1995). Specifically, familial alcoholism has been related to an earlier age of onset of both regular and problematic alcohol use (Shuckit, 1984; Penick et al., 1987; Hill & Yuan, 1999; Hill et al., 2000).

Given that substances do share a similar vulnerability to abuse (Tsuang et al., 1998), it is not surprising that family history of SUDs may also be indicative of greater severity of secondary drugs of abuse or dependence. In a study of opiate dependent women by Coviello and colleagues (2004), described earlier, high risk probands (those with either two or more first-degree relatives or one first-degree or two or more second-degree relatives with a substance use problem) were more likely to report greater lifetime and past month use of alcohol, than low risk probands (those with no more than one second-degree relative with substance use problems). Additionally, the high family risk had more family and social problems than either the medium or low risk group. These findings suggest that when considering the influence of family history on substance use severity, it may be important to consider additional substances, other than the individual's primary substance of use.

Parental substance use and substance use severity. Some studies have focused specifically on parental substance use problems and how substance use severity in offspring might vary according to the number of parents with SUD. In an early study of alcohol transmission, McKenna and Pickens (1981) investigated the relationship between number of parents with alcoholism and pretreatment variables (e.g., age of first

intoxication, duration of problem drinking, behavioral problems) in men and women in inpatient treatment. Number of alcoholic parents was significantly related to the mean age at admission, age when first intoxicated, and number of years drinking, such that probands with 2 alcoholic parents were younger at treatment entry, became intoxicated at an earlier age, and had a shorter duration of drinking than probands with one or no alcoholic parent. Further, individuals with two alcoholic parents also had a greater number of alcohol-related arrests, number of days in jail, and were suspended more often than individuals with one or no alcoholic parent. Interestingly, no evidence was found to support a relationship between number of alcoholic parents and drinking severity or number of symptoms of alcoholism. Based on these findings, the authors posit that parental influence may exert an effect more so on the development of alcoholism than on the course or treatment of alcoholism.

Using similar methods, but instead focusing on alcohol and drug use problems combined, Boyd and colleagues (1999) found evidence for the association between parental history and substance use severity among individuals in outpatient substance abuse treatment. In general, this association varied as a function of number of parents with substance use problems supporting an additive effect. For instance, individuals with both parents affected were more likely to have an alcohol and drug problem and higher ASI Drug Composite scores, suggesting greater severity of substance use problems, than individuals with one or no parent affected. In support of Coviello and others (2004), Boyd and colleagues (1999) also found greater family and social problems among individuals with a more dense parental history (i.e., both parents had alcohol and/or drug problems) of

substance use problems. A notable limitation of the Boyd and others (1999) study was that data did not distinguish between the proband's alcohol and drug problems, but rather considered them together. In the study of opiate-dependent patients by Coviello and colleagues (2004), the density of familial substance use history affected alcohol use. Given these findings and the possibility that transmission could be substance specific (Merikangas et al., 1998b), considering alcohol and drug problems separately for both the individual and parent may provide a more complete picture of the influence of parental substance use on proband substance severity.

Others (Lieb et al., 2002; Westermeyer et al., 2007) have examined parental substance use problems and offspring SUD and considered alcohol and drug use disorders separately. Additionally, they have investigated whether parental influence follows a dose-response pattern, such that probands with parents who are both affected exhibit problems of the greatest severity, followed by those with one parent affected, and finally, those with neither parent having the disorder. Lieb et al. (2002) focused specifically on alcohol and found mixed results for an additive effect of number of parents affected. Longitudinal data indicated different patterns of hazardous alcohol use by the number of parents affected with alcohol use problems. Higher rates of hazardous alcohol use were observed in individuals with two affected parents compared to one or no parents affected. Also, an earlier age of onset of hazardous alcohol use was associated with having two affected parents compared to having neither parent affected.

Similar to Lieb and others (2002), Westermeyer and colleagues (2007) also examined whether a dose-response relationship could be identified between number of

parents with SUD and proband's SUD severity and morbidity. Parental SUD was strongly and inversely related to age at first use for alcohol and tobacco, but not illicit drugs. Parental SUD was also significantly related to number of drugs used in lifetime but not the duration for which substances were used. Based on the total score of the Minnesota Substance Abuse Problem Scale (M-SAPS), parental SUD was related to SUD severity in offspring. However, logistic regression analyses only support an additive parental effect for age at first alcohol use, meaning that having both parents with a SUD, compared to only one parent, indicates a younger age of first use. Despite these studies, it is still unclear how the degree of parental substance use problems affects offspring SUD and severity.

Gender Differences

The effect of family history on SUDs in offspring may also vary by gender. As would be expected given gender differences in prevalence rates of substance use disorders, higher rates of alcohol and drug use problems have been reported among male relatives than female relatives (Pickens et al., 2001; James & Adams, 2003). Transmission of SUDs may vary by gender of the affected parents or relatives and also by probands' gender (Pickens et al., 2001; Sannibale & Hall, 2001; Lieb et al., 2002; Pollack et al., 1987; Curran et al., 1999; McGue et al., 1992).

Alcoholism. An earlier meta-analysis of family alcoholism studies suggests that rates of alcoholism between parent-offspring pairs vary by gender (Pollack et al., 1987). Men and women with AUD are likely to come from homes where their biological father was alcoholic. However, women but not men with AUD are also likely to come from

homes where their biological mother was alcoholic (Pollack et al., 1987). Additional research supports these findings. In a mixed treatment and community sample of alcohol dependent individuals, men were more likely than women to report paternal alcohol problems whereas women were more likely to report alcohol problems among female relatives (Sannibale & Hall, 2001). These findings are congruent with the findings of early family and adoption research supporting higher rates of same sex parent-offspring alcoholism than expected by chance (Cotton, 1979; Goodwin, 1971; Bohman et al., 1981). Gender may also affect the association between family history and substance use severity. For example, in a longitudinal, community study of late adolescents and young adults, Lieb and colleagues (2002) found that paternal alcohol use disorders (AUD) were associated with a shift in offspring from regular to hazardous use, whereas maternal AUD was associated with a progression from occasional to regular use of alcohol. The authors attribute this difference to the fact that fathers likely show more risky alcohol use than mothers and that children model this use. However, this was the only gender difference in associations between parental history and SUD in offspring found in the study.

Drug use disorders. Gender differences in the familial transmission of drug use disorders alone have been studied less often, as studies have tended to combine alcohol and drug use disorders. In a study where alcohol and drug use problems were considered together in treatment-seeking adults, female probands were more likely to have a mother with substance abuse problems than male probands (James & Adams, 2003). Conflicting findings do exist. Kendler and colleagues (1997), using family history data from the National Comorbidity Study, found little evidence for the effect of gender on familial

transmission of substance use disorders. The same conclusion was true within a sample of substance dependent and control probands (Merikangas et al., 1998b). Given mixed findings, research should further examine gender differences in associations between family history and SUDs (Lieb et al., 2002).

Comorbid Substance Use and Psychiatric Disorders

Prevalence of Comorbid Disorders

General population. Comorbid psychiatric disorders are common among individuals with substance use disorders (Regier et al., 1990). Both depression and anxiety have been found to co-occur with substance use disorders (Mills et al., 2006; Tsuang et al., 2001). Based on the 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC; Compton et al., 2007) as previously described, substance use disorders have been found to co-occur with mood, anxiety, and personality disorders. Even after controlling for sociodemographic factors, individuals with drug use disorders are at an increased risk for psychiatric disorders, including Major Depressive Disorder (OR = 2.0), Bipolar I (OR = 4.8), Panic Disorder (OR = 3.4), Social Phobia (OR = 2.5), and Generalized Anxiety Disorder (OR = 2.8). Additional findings from the NESARC indicated that 30-40% of individuals with any lifetime drug use disorder reported at least one anxiety or mood disorder (Conway et al., 2006).

Gender differences. Research suggests women may be at greater risk for comorbid substance use and psychiatric disorders than men (Conway et al., 2006). Studies have found that women with SUDs have higher rates of some psychiatric disorders compared to men, such as mood, anxiety, and eating disorders, and may present with more symptoms of

psychological distress than men (Brady & Randall, 1999; Merikangas et al., 1998; Sonne et al., 2003; Sannibale & Hall, 2001). For example, investigators have found women with alcohol problems are likely to present with comorbid depression (Kasperowicz-Dabrowiecka & Rybakowski, 2001; Dunne et al., 1993). Additionally, among a mixed sample of treatment and non-treatment seekers, women had more diagnoses of generalized anxiety disorder, depression, and dysthymia than men (Sannibale & Hall, 2001).

Treatment-seeking population. Prevalence of comorbid substance use and psychiatric disorders may be even higher among treatment seeking populations (Compton et al., 2007). Based on NESARC data, comorbid psychiatric disorders were significantly associated with treatment- or help-seeking behaviors in individuals with drug use disorders. In addition, comorbidity was greater among help-seeking individuals with SUD than individuals who did not seek help or treatment (Compton et al., 2007). Reiger and colleagues (1990) found individuals in treatment for SUDs to be significantly more likely to have comorbid disorders than those not in treatment.

Pregnant women. In particular, pregnant drug-dependent women in treatment are likely to have high rates of comorbid psychiatric problems (Hans, 1999; Horrigan et al., 2000). A study by Miles and colleagues (2001) compared Minnesota Multiphasic Personality Inventory –Revised (MMPI-2) protocols of pregnant drug-dependent women admitted to a comprehensive treatment program. In general, rates of psychopathology were high among the women, with over 89% of the women having at least one clinically-elevated scale and over half having at least three clinically-elevated scales.

Family History and Comorbid Disorders

Similar methodology to family studies of proband SUD has been used to examine the influence of familial substance use problems on offspring psychopathology (Westermeyer et al., 2006; Dawson & Grant, 1998; Hill & Muka, 1996). Study findings indicated a family history of substance use problems was also associated with comorbid SUD and psychiatric problems in offspring (Sbrana et al., 2007; Kasperowicz-Dabrowiecka & Rybakowski, 2001; Grant et al., 1996; Dawson & Grant, 1998; McKenna & Pickens, 1983; Jones-Saumty et al., 1983; Jacob & Windle, 2000).

Many studies suggest an etiological role of family history of substance use problems, specifically alcohol problems, and comorbid psychiatric and substance use disorders in offspring. For instance, depression, Obsessive Compulsive Disorder, Panic Disorder, and Post-traumatic Stress Disorder were all found in significantly increased rates (odds ratios range from 4.3 to 7.8) in relatives of probands with alcohol dependence compared to controls (Nurnberger et al., 2004). Further, comorbid primary depression, where the age of onset of depression preceded alcohol dependence, in individuals with alcohol problems was associated with a higher frequency of familial alcoholism and depression (Kasperowicz-Dabrowiecka & Rybakowski, 2001). Results from epidemiological data also point to the influence of family history: there was a direct positive relationship between the odds ever having alcohol dependence, either alone or with comorbid depression, and the percentage of first- and second-degree relatives with alcoholism (Dawson & Grant, 1998). These results confirm earlier findings by the authors (Grant et al., 1996). Further research is needed to determine whether these findings,

related to the influence of familial alcoholism on comorbidity, are also true for familial drug use problems.

The association of family history between substance use problems and offspring psychiatric problems has been evidenced in childhood (Hill & Muka, 1996). Children in the high risk group (mean age = 11.3 years), who were part of a larger study of alcoholism and on average had 3.8 alcoholic first- and second-degree relatives, were more likely to have an internalizing disorder (i.e., depression, dysthymia, overanxious disorder, social phobia, and simple phobia) than children in the low-risk group, who had no first- or second-degree relatives diagnosed with alcoholism. Interestingly, this relationship emerged despite possible buffering effects of the relatively high SES levels of families.

Parental history of SUD. Comorbidity literature has also specifically explored parental history of substance use problems. Pickens and colleagues (2001) found that individuals with a parental history of substance use problems had more total DSM-III-R lifetime symptoms, specifically non-substance-related psychiatric disorder diagnostic symptoms, than those who did not. Other studies have shown high rates of familial substance use problems among individuals with comorbid disorders. Similar to the methodology used to investigate the relationship between parental density of substance use problems and probands SUD (Westermeyer et al. 2007; Lieb et al., 2002), Westermeyer and colleagues (2006) examined how psychiatric morbidity varied as a function of number of parents with SUD. There was a significant relationship between individuals' report of psychiatric problems on the 90-item Symptom Checklist (SCL-90) and parental density of SUD. However, the relationship between psychiatrist-rated measures of psychopathology

(i.e., Hamilton Anxiety Scale, Hamilton Depression Scale) and parental SUD only approached significance. Additionally, parental SUD was significantly related to lifetime history of any psychiatric treatment, such that individuals with 2 parents with SUD were the most likely to have had psychiatric treatment (81%), followed by individuals with 1 parent with SUD (70%) and those with no parents with SUD (66%). Based on the study results, the authors concluded that parental SUD is associated with increased psychiatric symptoms in the mild to moderate range. Overall, these studies provide support that psychopathology is greater among individuals with a parental history of substance use problems.

Gender differences. Some evidence for gender differences in the influence of familial transmission of substance use problems on psychopathology in offspring exists. One specific hypothesis regarding gender differences is that maternal alcoholism may be more strongly associated with internalizing problems in offspring (Winokur & Coryell, 1991; Ohannessian et al., 2004; Fox & Gilbert, 1994; Corte & Becherer, 2007), while paternal alcoholism is more strongly associated with externalizing problems (Zucker et al., 1995; Malone, Iacono and McGue, 2002).

Conclusions by Hill and Muka (1996) offer further explanation of maternal influences. In a family history study of female alcoholism (Hill and Muka, 1996; described above), the authors found significantly more children with psychopathology coming from families with two alcoholic parents than children in their other study of male alcoholism (Hill & Hruska, 1992). Although the authors did not directly compare maternal and paternal within a single study, they suggested that maternal alcoholism may have greater

negative outcomes for children because women tend to provide more care to children than do men and thus children may be more affected by the presence of alcoholism in their mother. This hypothesis is indirectly supported by the finding that drug dependent mothers may have more interactional problems with their children than mothers with no SUDs (Mayes, 1995). However, additional research directly comparing maternal and paternal SUD transmission is needed to test Hill and Muka's hypothesis. Further, the majority of this research has been conducted with alcoholism, with very little attention paid to other substances of abuse or dependence, so additional research focused on drug problems is warranted.

Family History of Substance Abuse in Pregnant Women

Only three studies to date have examined the influence of parental alcohol and drug use on women who use substances during pregnancy. Miles, Svikis, Haug, and Pickens (2001) examined familial risk among pregnant substance dependent women (N = 278) enrolled in a comprehensive substance abuse treatment and prenatal care program. Using the Family Alcohol and Drug Survey (FADS) to assess for family history of substance abuse, the investigators found significant associations between parental problems and the prevalence and severity of substance use and psychiatric problems in the pregnant probands. Pregnant women who reported paternal alcohol problems (40%) were twice as likely to have alcohol problems themselves as women who did not report paternal alcohol problems. A trend was observed between report of maternal alcohol use and increased risk of alcohol problems, yet maternal problem alcohol use was significantly associated with greater psychiatric problems. Additionally, both paternal (22%) and maternal (14%) drug

use was significantly associated with such severity indicators as earlier age of onset, choice of highly addictive drugs, and number of months of drug use by the women. Based on these results, parental alcohol problems may be associated with increased risk of alcohol and psychiatric problems in drug-dependent women, while parental history of drug use may be associated with greater drug use severity.

In the second study (Savage & Wray, 2004), 193 women in their third trimester of pregnancy were recruited from two inner-city prenatal care clinics to complete a questionnaire about their use of alcohol and tobacco during pregnancy and their parents' use of alcohol and tobacco. Unlike the study by Miles and colleagues (2001), participants did not have a diagnosis of a substance use disorder. Rates of heavy drinking (more than 4 drinks per drinking occasion) among participants' fathers and mothers were 26.3% and 12.3%, respectively. Results indicated that neither paternal nor maternal alcohol problems were associated with greater risk of alcohol use during pregnancy. These findings are likely inconclusive because only a small number of women reported alcohol use during pregnancy ($n = 25$, 14.6%) and this may have limited the ability to detect differences between groups. Therefore, in order to more thoroughly examine the influence of parental substance use problems on substance use in pregnant women, a sample of known substance-dependent pregnant women should be utilized.

Although their main focus was not family history, Derauf and colleagues (2007) examined demographic and psychosocial characteristics of mothers who used methamphetamine (MA) during pregnancy. A group of MA and non-MA users were selected from participants of a larger study based on their own self-report of MA use and

meconium screening. Women who used LSD, PCP, opiates, or cocaine but not MA during pregnancy were excluded, while women who used tobacco, alcohol, or marijuana but no MA were included in the group of non-MA users. Thus, the non-MA group also includes women who used licit and illicit substances during pregnancy so use of other substances during pregnancy was controlled for as covariates. Results indicated women who used MA during pregnancy were more likely to report having family and social systems where substance use is the norm. This finding provides general support for the influence of family members' substance use on women's use during pregnancy.

Statement of the Problem and Hypotheses

Rationale

Through various methodologies, studies have demonstrated a relationship between family history of substance use problems and adverse outcomes in offspring (McKenna & Pickens, 1983; Shuckit, 1984; Jones-Saumty et al., 1983; Stabenau, 1990; Grant et al., 1996; Hill & Muka, 1996; Dawson & Grant, 1998; Hill & Yuan, 1999; Hill et al., 2000; Jacob & Windle, 2000; Pickens et al., 2001). Specifically, family history has been associated to some extent, with more severe SUDs (Boyd et al., 1999; Pickens et al., 2001; Coviello et al., 2004) and greater psychiatric problems (Hill & Muka, 1996; Dawson & Grant, 1998; Nurnberger et al., 2004). However, there are few examples of family history studies that have examined both substance use and psychiatric severity in offspring. Given their tendency to co-occur and similarity in negative consequences, studying both may provide a more complete picture of familial influence. Additionally, studies tend to either examine familial alcohol problems only or alcohol and drug problems combined, but rarely separate the two. Considering familial alcohol and drug problems separately may further disentangle how these problems influence offspring psychopathology.

Many investigators have noted a need to examine maternal and paternal substance use problems separately in studying the effects on offspring psychopathology (Hill &

Muka, 1996; Ohannessian & Hesselbrock., 1994, 2004; Luthar et al., 1993). This need also arises from conflicting findings regarding the presence of gender differences in familial transmission of SUDs (Luthar et al., 1993; Pollock et al., 1987; Sannibale & Hall, 2001; Lieb et al., 2002; Curran et al., 1999; Merikangas et al., 1998b; Kendler et al., 1997). To date, no study has examined the association between alcohol and drug problems separately in mothers and fathers and the severity of offspring psychopathology. For that reason, the present study will examine parental substance use by both maternal and paternal problems to explore possible gender differences in the transmission of SUDs.

In order to study the incidence of parental substance problems on probands' substance use and psychiatric severity, it is important to utilize a sample of individuals with known substance use problems. Thus, pregnant women in treatment for SUD represent an appropriate population of interest for the proposed study. Furthermore, using treatment-seeking individuals eliminates the issues associated with underreporting of use due to fear of social stigma and negative consequences (Ondersma et al. 2000, 2001).

Previous research with pregnant women (Miles, Svikis, Haug, & Pickens, 2001; Savage & Wray, 2004; Derauf et al., 2007) provides initial support for the association between parental history of substance misuse and indicators of substance use and psychiatric severity among these women. Further research on the familial transmission of SUDs within this population is important for many reasons. First, particularly with familial alcoholism research, there has been a tendency to focus on the paternal transmission of psychopathology. Given some evidence for gender-specific transmission (Sannibale & Hall, 2001; Lieb et al., 2002), studies that also investigate the relationship

between maternal history and psychopathology severity in female offspring are needed. Second, further examination of the association between parental history and offspring substance use and psychiatry severity could lead to identification of specific risk factors (i.e., maternal and/or paternal alcohol and/or drug problems) of more severe substance use or greater psychiatric problems. Identification of such risk factors would be helpful in screening for high-risk women in such settings as Obstetric (OB) clinics and provide an opportunity for intervention.

Aims and Hypotheses

The purpose of the proposed study was to examine the relationship between history of parental substance abuse and both substance use and psychiatric severity measures in a sample of treatment-seeking, pregnant women who meet DSM-III-R criteria for lifetime opioid and cocaine abuse/dependence. Hereafter, the pregnant drug dependent women were also referred to as “probands”. The first aim of this study was to summarize the incidence of parental substance problems (maternal and paternal alcohol and drug problems, parental alcohol problems, and parental drug problems) among participants and describe their substance use and psychiatric severity. Additional aims of this study were to examine proband substance use and psychiatric symptom severity in: 2) those with a history of 0, 1 or both parents affected by alcohol problems; and 3) those with a history of 0, 1 or both parents affected by drug problems. For significant family history and severity relationships, two additional specific aims were to further examine proband substance use and psychiatric severity measures in: 4) those with and without a paternal history of

alcohol or drug problems; and 5) those with and without a maternal history of alcohol or drug problems.

Hypotheses for the second and third specific aims posit a dose-response relationship between number of parents affected by substance use problems and degree of proband substance use and psychiatric severity. Specifically:

1) For parental alcohol problems, probands with neither parent affected will have the lowest severity problems, followed by those with one parent affected, and finally those with both parents having problems.

2) For parental drug problems, probands with neither parent affected will have the lowest severity problems, followed by those with one parent affected, and finally those with both parents having problems.

The hypotheses for the fourth and fifth specific aim are as follows:

3) For paternal alcohol and drug problems, probands with a positive history (e.g., having a father with alcohol problems) will be more likely to have more severe substance abuse and psychiatric symptoms than probands without such history.

4) For maternal alcohol and drug problems, probands with a positive history (e.g., having a mother with alcohol problems) will be more likely to have more severe substance abuse and psychiatric symptoms than probands without such history.

Method

Participants

Participants were pregnant women admitted to the Center for Addiction and Pregnancy (CAP), part of the Johns Hopkins Bayview Medical Center in Baltimore, Maryland. Women were recruited as participants in one of three consecutive behavioral treatment studies (Svikis et al., 1997; Jones et al., 2000; Jones et al., 2001; Svikiş et al., 2007) between January, 1995 and August, 1997. To be eligible for participation in any of the three behavioral treatment studies, women had to be 18 years old or older and seeking their first admission to the program during the current pregnancy. Women with acute psychiatric distress that precluded study participation were excluded. Participation rates across the three studies averaged 94% and complete data were available for 488 women. Of these women, 189 were excluded because they did not meet diagnostic criteria for the present study (see Inclusion Criteria below) and an additional 39 were removed because were unable to characterize the alcohol and drug use patterns for their biological mothers and fathers. (see Exclusion Criteria below). The final sample included 260 participants (53% of the initial sample).

CAP is a comprehensive, multidisciplinary program for drug-dependent pregnant women and offers both outpatient and residential treatment with a wide array of onsite services, including mental health and substance abuse treatment, obstetrics/gynecology and family planning. It was specifically developed to address many of the barriers pregnant

drug-dependent women face (Jansson et al., 1996). Treatment consisted of one week of residential care followed by intensive outpatient treatment with gradual reductions in frequency of attendance through delivery and post-partum. Women were referred to CAP from a variety of sources, including local community treatment providers, self- or family-referrals, and court referrals.

For the current study, the following inclusion and exclusion criteria were used:

Inclusion Criteria: Only women who met lifetime DSM-III-R criteria for both Opiate Abuse/Dependence and Cocaine Abuse/Dependence were included in the study (N = 299).

Exclusion Criteria: Because of the need for a complete picture of parental problems, women who responded “don’t know” for parental alcohol and/or drug problem variables were omitted. This resulted in 39 women being excluded from the dataset, decreasing the total number of women from 299 to 260. In the majority of cases, information was missing for the biological father (82%) and in all but one case both alcohol and drug information were labeled as “unknown.” Excluded cases were not significantly different from those included in analyses on demographic characteristics such as race, marital status, and years of education. However, women who had missing parental history information tended to be younger ($M = 26.8$, $SD = 4.76$) than women who had complete information ($M = 28.6$, $SD = 4.32$).

Secondary data analysis, as part of the current study, was approved by Virginia Commonwealth University’s Institutional Review Board under the title, “The Influence of

Maternal Family History on Current Psychopathology among Drug-Dependent Pregnant Women.”

Measures

The current study used two standardized measures as data sources: the Addiction Severity Index and the Structured Clinical Interview for DSM-III-R Axis I disorders.

Addiction Severity Index, Version 5 (ASI; McLellan et al., 1992). The ASI is a semi-structured interview that assesses seven domains of psychosocial functioning commonly affected by alcohol and drug dependence: medical, employment/support, alcohol, drugs, legal, family/social, and psychiatric. It was designed to detect and measure the severity in these areas with severity defined as “need for additional treatment” (McGahan et al., 1986). Objective data is provided on the number, extent, and duration of problem symptoms, with a focus on two time periods: the 30 days prior to the patient’s enrollment in treatment (referred to as “past 30 days”) and the patient’s lifetime.

In addition, the interviewer rates the patient’s need for additional treatment in each domain of psychosocial functioning. This interviewer severity rating is based on objective patient data as well as subjective assessment of the person’s treatment needs at enrollment (McLellan et al., 1992). Rating scores range from 0, indicating no treatment is necessary, to 9, indicating treatment is extremely important. A rating of 4 or greater indicates a problem is present that warrants inclusion on a patient’s treatment plan. The interviewer severity rating is considered useful in summarizing the patient’s overall status at treatment admission, developing an initial treatment plan, and providing a general prognosis for treatment (McGahan et al., 1986). Interviewer severity ratings have shown to be reliable,

with 89% agreement between raters, and valid measures of patient severity status in each of the seven levels of functioning (McLellan et al., 1985; Hodgins & El-Guebaly, 1992).

Family history information concerning alcohol, drug, and psychiatric problems is also collected for biological maternal and paternal, first- and second-degree relatives during the ASI interview. The family history module was added to the ASI in Version 5 (McLellan et al., 1992) and functions as a stand-alone section with no interviewer severity rating or composite score. Previous research has used this section to categorize individuals' family history of substance use (Pickens et al., 2001). In comparison to the Family Alcohol and Drug Survey (FADS; Pickens et al., 1991), a well-validated measure of familial substance use based on Feighner Research Diagnostic Criteria for Alcohol and Drug Abuse (Pickens et al., 1991; Andreasen et al., 1977; Andreasen et al., 1986), the ASI Family History section demonstrated high specificity and sensitivity to parental alcohol use as measures by Type A alcohol problems. ASI and FADS alcohol items were significantly correlated ($r = .6$).

As a state reporting agency, CAP was required to participate in the state database, Substance Abuse Monitoring Information System (SAMIS). Consequently, items were added to the ASI as supplementary (typically at the end of various sections) so that the SAMIS data collection items could be obtained at the same time as ASI administration. Quantity of drug use is not assessed in the standard ASI because it would be difficult (if not impossible) to identify a common yardstick as purity levels and prices vary by geographic location. However, for a program such as CAP, where the majority of probands resided in one of several zip code areas in the City of Baltimore, quantity

estimates could be estimated. Therefore, questions about the dollar amount of heroin and cocaine used per day were added to the ASI. Finally, since tobacco use during pregnancy is associated with a host of adverse maternal and infant outcomes (U.S. Department of Health and Human Services, 2005), tobacco use was also assessed for both past 30 days (number of days smoking and average cigarettes per day) and lifetime (number of years of daily smoking and age at first cigarette). ASI interviews were conducted by trained BA- or MA-level research assistants. Monthly meetings were held to review coding and comments on randomly selected ASIs with independent reporting of Interviewer Severity Ratings (ISRs) so that reliability and validity of these ratings could be maintained over time.

Structured Clinical Interview for DSM-III-R Axis I disorders, Patient Edition (SCID-I-P; Spitzer et al., 1996). The SCID-Patient edition is a semi-structured interview that uses a decision-tree approach for determining DSM-III-R Axis I psychiatric disorders. Good construct validity for the substance abuse and dependence disorders and adequate test-retest reliability for the measure has been demonstrated (Feingold & Rounsaville, 1995; William et al., 1992). Excellent inter-rater reliability using the SCID-I was found for most disorders (Skre et al., 1991). For the present study, master's level research assistants completed training with the P.I. (Svikis) and then completed at minimum, two observed SCID interviews with co-ratings and subsequent review. If diagnostic concordance was achieved for all Axis I disorders, interviewers were certified to proceed with study assessments. If not, an additional SCID was co-rated until 100% diagnostic concordance was achieved. Rarely did this require more than two SCID administrations

and following certification, monthly case discussion groups were held to review randomly-selected SCID interviews and discuss coding and diagnostic assignments. This occurred during all subject recruitment periods with additional review of coded SCIDs by the supervisor.

Design and Procedures

The study used the family history method and a cross-sectional design that included participants from ongoing behavioral treatment studies at CAP. All women were administered the ASI as part of standard intake procedures by trained staff members. Typically during this time, women were also approached by a member of the research staff and told about the behavioral treatment study that was active at that time. If the woman agreed to the study, written informed consent was obtained and she was scheduled to complete additional assessments including the Structured Clinical Interview for DSM-III-R. Thus, the SCID was completed only for those women who provided informed consent to research participation. The ASI was usually administered within 1-2 days of a woman's admission to CAP while the SCID-I- was typically administered on Day 3 or 4 of treatment.

Variables

Demographic information was obtained from the general information and psychosocial functioning sections of the ASI. Continuous variables included age and years of education, while categorical variables were race, marital status, and employment status. Preliminary data analysis of response frequencies will determine how categorical variables should best be grouped.

Parental Substance Use. Parental history of substance use was operationalized using patient responses to the ASI questions (separately for biological mother and biological father): ‘Did your biological ____ have what you would call a significant drinking problem - one that did or should have led to treatment?’ An identical question was asked about drug problems for each parent. Four dichotomous variables (0 = no problem, 1 = problem) were created for: maternal alcohol problem, maternal drug problem, paternal alcohol problem, and paternal drug problem. From these variables, two composite variables, parental density of alcohol problems and parental density of drug problems, were created to describe the degree of parental substance abuse (coded as 0=no parents with the disorder, 1= one parent with the disorder, 2 = both parents with the disorder).

Substance Use and Psychiatric Severity in Pregnant Women. To measure substance use severity and psychiatric symptomatology in the patient sample, a subset of ASI and SCID variables were selected. Selection was based on a review of the ASI literature as well as previous studies focused on the target population. Variables were formed from individual questions and interviewer severity ratings from the Alcohol/Drug and Psychiatric Status sections of the ASI and DSM-III-R diagnoses from the SCID were used.

Specifically, the item, age of first self-initiated alcohol use, from the ASI and lifetime DSM-III-R diagnosis of alcohol abuse or dependence from the SCID were chosen to represent alcohol use severity. Drug use severity was described by a combination of heroin, cocaine, nicotine, and drug problem questions from the ASI. For heroin and cocaine, selected items include: age of first self-initiated use, number of days used in past

30 days, number of months of regular use (regular use defined as using a minimum of 3x/week, every week) in lifetime, typical amount used daily in US\$ in the past 30 days. As previously mentioned, the term “past 30 days” refers to the 30 days prior to the woman entering treatment at CAP. Nicotine items also included age of first self-initiated use, number of days used in past 30 days, number of months of daily use in lifetime, and typical number of cigarettes smoked per day in past 30 days. Two additional items, which considered all drugs in combination, were used to further define substance use severity: number of days in the past 30 experienced drug problems and the Interviewer Severity Rating for drug problems (scored on a scale from 0-9). Many of these variables from the ASI and SCID items were later altered and recoded to address non-normality (see the Substance Use and Psychiatric Severity section in Results). A list of all variables used in analyses as they appear in their final form is presented in Table 1.

Table 1

Substance Use and Psychiatric Severity Variables

Substance Use Severity		
Substance	Variable	
Alcohol	Age of first self-initiated use	
	Lifetime DSM-III diagnosis of alcohol abuse or dependence	
	No/Yes	
Drugs	Heroin	Age of first self-initiated use
		Type of use in past 30 days
		Non-regular use (less than 12 days)
		Regular use (12 or more days)
		Months of regular use in lifetime
		Shorter history of regular use (70 months or less)
		Longer history of regular use (greater than 70 months)
		Typical amount in \$ used daily in past 30 days
		Small (\$0-30)
		Medium (\$31-70)
		Large (+\$71)
Cocaine	Age of first self-initiated use	
	Type of use in past 30 days	
	Non-regular use (less than 12 days)	

(Table 1 continued)

	Regular use (12 or more days)
	Months of regular use in lifetime
	Shorter history of regular use (48 months or less)
	Longer history of regular use (greater than 48 months)
	Typical amount in \$ used daily in past 30 days
	Small (\$0-15)
	Medium (\$16-45)
	Large (+\$46)
Nicotine	Age of first self-initiated use
	Type of use in past 30
	Never or rarely (0-3 days)
	Daily or almost daily (26-30)
	Months of daily use in lifetime
	Amount used daily in past 30 days
	Less than a pack of cigarettes (<19)
	Pack of cigarettes or more (>19)
All	Days in past 30 experienced drug problems
	Interviewer Severity Rating for drug problems (0-9)
Psychiatric Severity	
	Variable ^a

(Table 1 continued)

Experienced serious depression-sadness, hopelessness, loss of interest
for a significant period of time in lifetime

Experienced serious anxiety/tension-uptight, unreasonably worried, in
ability to feel relaxed for a significant period of time in lifetime

Experienced any days of psychological or emotional problems in past
30 days

Experienced serious thoughts of suicide/seriously considered a plan
for taking one's life in lifetime

Attempted suicide

Received treatment (inpatient and/or outpatient) for any
psychological/emotional problems in lifetime

Interviewer Severity Rating for psychiatric problems

Rating did not warrant psychological treatment

Rating warranted psychological treatment

^aCoded as No/Yes unless otherwise indicated in parentheses

Psychiatric severity was described using items from the ASI (see Table 1) and included the following items, all focused on lifetime (have you ever): experienced serious depression-sadness, hopelessness, loss of interest for a significant period of time (minimum of two weeks; coded as no/yes), experienced serious anxiety/tension-uptight, unreasonably worried, inability to feel relaxed for a significant period of time (coded no/yes), ever experienced serious thoughts of suicide to the point of having a plan for

taking one's life during lifetime (coded no/yes), attempted suicide (coded no/yes), ever received treatment, either inpatient or outpatient, for any psychological/emotional problems in lifetime (coded no/yes), and Interviewer Severity Rating for psychiatric problems (scored from 0-9). Responses related to symptoms of anxiety and depression were coded positively only if the problems were not a direct result of alcohol/drug use. Responses related to suicide were coded positively if they were experienced regardless of alcohol/drug use. In addition, the item, have you experienced any days of psychological or emotional problems in the past 30 days (coded no/yes), was also included.

Data Analysis Plan

Demographics and Initial Analyses. Statistical analyses were performed using SPSS v.16.0 (SPSS, Chicago, IL). Descriptive analyses to describe probands' demographic characteristics (e.g., age, race) were calculated. Frequency distributions of continuous variables that represented substance use and psychiatric variables were examined for evidence of non-normality and outliers. If the data contained outliers and there was a meaningful rationale to remove them (e.g., outliers were not expected), they were coded as missing. If by removing outliers the data were normal, no further changes were made to the variable and either analysis of variance (ANOVA) or analysis of covariance (ANCOVA) was used to examine the effect of parental density of substance use problems on severity of substance use and psychiatric problems. However, if outliers were expected due to the severity of substance use in the sample (e.g., reporting 16 years of regular cocaine use) and the distribution was non-normal (skewness > 1 and kurtosis >1) or the data was still non-normal after removing outliers, it was decided that variables would not

be not transformed but instead re-coded into meaningful categories. The decision not to transform variables was made because variables were measured on a meaningful scale (e.g., number of days in past 30) and transformation would have made interpretation difficult. Variables were re-coded from continuous to categorical variables because non-normal variables prevented the use of ANOVA. Instead, binary or ordinal logistic regression was used to predict whether parental density of substance problems predicted classification to a more severity substance use or psychiatric category (e.g., whether a woman used heroin regularly in the past 30 days or not). The removal of outliers and re-coding of variables is further described in the Substance Use and Psychiatric Severity section of the Results. Following the re-coding of any non-normal variables, mean scores and frequencies were calculated for each substance use and psychiatric variables. The frequencies of parental history variables were also described.

Hypotheses. After necessary variables were re-coded, the hypothesized relationships between density of parental substance use problems and substance use and psychiatric severity variables were examined. This was done for both parental density of alcohol problems (Hypothesis 1) and parental density of drug problems (Hypothesis 2) by using various statistical analyses depending on how severity variables were coded. For variables coded on a continuous scale (e.g., age of first use of alcohol), either ANOVA or ANCOVA was used. When significant relationships were found, post-hoc comparisons were conducted using Tukey HSD tests to determine which parental group comparisons were significant. For variables coded on a categorical scale, logistic regression was used. Binary logistic regression was utilized for variables that were dichotomously coded (e.g.,

used heroin regularly in past 30 days or did not use heroin regularly in the past 30 days) to determine whether density of parental problems significantly predicted classification to the severe category. Ordinal regression was used if severity variables were coded into more than 2 rank-ordered categories (e.g., small, medium, or large amount of heroin used daily in past 30 days).

When significant relationships were found between parental density of substance problems and substance use severity variables using ANOVAs and ANCOVAs, multiple regression and hierarchical multiple regression were used to further explore whether paternal history of problems (Hypothesis 3) and maternal history of problems (Hypothesis 4) significantly predicted the continuous severity variable. If parental density of problems significantly predicted classification to the more severe substance use or psychiatric category using binary and ordinal regression, logistic regression would again be used to further predict whether paternal history of problems (Hypothesis 3) and maternal history of problems (Hypothesis 4) significantly predicted the classification to the more severe category.

Results

Demographics

Descriptive statistics were calculated to examine participant characteristics. The average age of participants was 28.6 years (SD= 4.32). The majority of the women identified themselves as Black (85%) with the remainder identifying as White. On average, the women received 11 years of formal education (SD = 1.76) and had never married or were currently single (88%).

Race Analysis

Two hundred and twenty one of the 260 women identified as Black. Parental density did not vary by race for either alcohol problems, $\chi^2(2) = 2.83$, $p > .05$, or drug problems, $\chi^2(2) = .62$, $p > .05$.

Descriptive Analyses

The first aim of this study was to summarize the incidence of parental substance problems separately for fathers, mothers, and both parents combined (maternal, paternal, and parental alcohol and drug problems). In addition, proband substance use and psychiatric severity were described.

Parental History. Of the 260 women who provided complete family history data on both parents, 63% ($n = 165$) reported that their father had substance use problems,

either alcohol or drug problems or both. In this subsample, alcohol problems alone were the most frequent (32%), followed by alcohol and drug problems (14%) and finally, drug problems alone (14%). Among the total sample, having a father with alcohol problems was reported by about half the women (49%, $n = 128$) and about a third (32%, $n = 82$) had a father with drug problems. A history of maternal substance use problems was reported by 31% ($n = 80$) of all women. Within this subsample, similar frequencies of alcohol problems alone (13%) and drug problems alone (12%) were reported with the remaining 5% reporting both alcohol and drug problems. Among the total sample, prevalence rates of maternal alcohol problems (18.5%, $n = 48$) and maternal drug problems (17.7%, $n = 46$) were also comparable. Parental history is further described in Table 2. When history of maternal and paternal alcohol problems were combined to form a single variable, parental density of alcohol problems, 45% ($n = 116$) of the sample reported neither parent had alcohol problems, 43% ($n = 112$) one parent with alcohol problems, and 12% ($n = 32$) both parents with alcohol problems. Among the women who reported one parent with alcohol problems, the majority (86%, $n = 96$) had a father with alcohol problems. When history of maternal and paternal drug problems were combined to form a single variable, parental density of drug problems, 60% ($n = 157$) of the sample reported neither parent had drug problems, 30% ($n = 78$) one parent with drug problems, and 10% ($n = 25$) both parents with drug problems. Among the women who reported one parent with drug problems, the almost three quarters (73%, $n = 57$) had a father with drug problems.

Table 2

Frequency of Parental Alcohol and Drug Problems, N = 260^a

Category	Type of Substance Abuse History			
	Neither substance	Alcohol problems only	Drug problems only	Alcohol and Drug problems
Mother	180 (69.2%)	34 (13.1%)	32 (12.3%)	14 (5.4%)
Father	95 (36.5%)	83 (31.9%)	37 (14.2%)	45 (17.3%)
Combined ^b	75 (28.8%)	82 (31.5%)	41 (15.8%)	62 (23.6%)

^aThe total for each row is 260.

^bCombined category considers mother and father problems together and whether there is any type of substance abuse history among either or both parents.

Substance Use and Psychiatric Severity. As previously mentioned, some items from the ASI and SCID were re-coded in order to address such issues as non-normality, interviewer or data entry errors, and small frequencies. This process was further described below for substance use (alcohol, nicotine, heroin, cocaine, and all drugs) and psychiatric severity variables. The means and frequencies for these variables are presented in Table 3 and 4.

Table 3

Descriptive Analyses of Substance Use Severity Variables, N = 260

Drug	Variable	Frequency	Mean	SD ^a	Range
Alcohol	Age of first self-initiated use	-	15.74	2.55	12-23
	Lifetime DSM-III diagnosis of alcohol abuse or dependence				
	Yes	71 (27%)	-	-	-
Heroin	Age of first self-initiated use	-	20.35	4.43	12-33
	Type of use in past 30 days				
	Regular use (12 or more days)	222 (86%)	-	-	-
	Months of regular use in lifetime				
	Longer history of regular use (greater than 70 months)	122 (50%)	-	-	-
	Typical amount used daily in past 30 days				
	Small (\$0-30)	94 (36%)	-	-	-
	Medium (\$31-70)	81 (31%)	-	-	-
	Large (+\$71)	85 (33%)	-	-	-
Cocaine	Age of first self-initiated use	-	21.24	4.42	12-34
	Type of use in past 30 days				
	Regular use (12 or more days)	149 (57%)	-	-	-

(Table 3 continued)

Months of regular use in lifetime					
Longer history of regular use	100 (48%)	-	-	-	
(greater than 48 months)					
Typical amount used daily in past 30 days					
Small (\$0-15)	73 (28%)	-	-	-	
Medium (\$16-45)	91 (35%)	-	-	-	
Large (+\$46)	96 (37%)	-	-	-	
<hr/>					
Nicotine	Age of first self-initiated use				
	During pre-teenage years (≤ 12 years)	45 (19%)	-	-	-
Type of use in past 30					
	Daily or almost daily (26-30 days)	226 (87%)	-	-	-
	Months of daily use in lifetime	-	135	76.52	0-384
Typical amount used daily in past 30 days					
	Pack of cigarettes or more (>19)	100 (38%)	-	-	-
<hr/>					
All	Frequency of drug problems in past 30 days				
	Daily (30 days)	193 (74%)	-	-	-

Interviewer Severity Rating (0-9)	6.02	.89	4-9
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^aSD = Standard Deviation

Table 4

Descriptive Analyses of Psychiatric Severity Variables, N = 260

Variable	Frequency
Experienced serious depression-sadness, hopelessness, loss of interest for a significant period of time in lifetime	103 (40%)
Experienced serious anxiety/tension-uptight, unreasonably worried, inability to feel relaxed for a significant period of time in lifetime	53 (20%)
Experienced any days of psychological/emotional problems in the past 30 days	97 (37%)
Experienced serious thoughts of suicide/seriously considered a plan for taking one's life in lifetime	107 (41%)
Attempted suicide	61 (24%)
Received treatment (inpatient and/or outpatient) for any psychological/emotional problems in lifetime	82 (32%)
Interviewer Severity Rating for psychiatric problems indicated treatment needed	80 (31%)

Variables with unexpected outliers included age of first use of alcohol, heroin, cocaine, and nicotine. All of these variables contained values of zero which indicated that the interviewer incorrectly included prenatal exposure to alcohol or drug in the data,

despite the intent of the question to measure age of first self-initiated use. Consequently, values of zero for alcohol (n=18), nicotine (n=22), heroin (n=1), and cocaine (n=1) were coded as missing. Once these cases were removed, the frequencies of age of first use for heroin and cocaine were normally distributed and thus no further manipulations to these variables were made. The mean ages of first use for these drugs are presented in Table 3.

The frequency of age of first use of alcohol, however, was not normally-distributed and thus was further examined. There were a number of cases which might also indicated non-self-initiated drinking and represent interviewer error in recoding a participant's response (e.g., an 8-year old takes a sip of her parent's alcoholic beverage does not count as the age in which they first used alcohol). Therefore, age 12 was chosen as a cut-off between unexpected and expected values because there was a large increase from 11 (n=8) to 12 (n=19) years in the number of individuals who first used alcohol at this age. Values less than 12 were re-coded as missing (n=18). Even after coding values less than 12 as missing, the distribution of age of first use of alcohol remained non-normal. As a result, outliers (cases with values greater than two standard deviations from the mean) were excluded with the rationale that alcohol is often used for the first time at an early age and late initiation of alcohol use is rare, especially among a population of substance-abusing individuals. Thirteen cases were removed which resulted in a normal distribution.

Once outliers were removed, the mean age of first self initiated alcohol use was 15.74 years. The other variable that represented severity of alcohol problems was whether or not a woman ever met DSM-III-R criteria for alcohol abuse and/or dependence in her lifetime. As shown in Table 3, 27% of the sample met criteria.

In addition to removing unexpected outliers, nicotine variables were re-coded from continuous to categorical variables because of non-normality. Age of first self-initiated use was dichotomized into first use during teenage years or older and first use during pre-teenage years. About a fifth (19%) began use before the age of 13. Number of days on nicotine use in the past 30 was changed to type of use in past 30 days and re-coded into two categories: never or rare (0-3 days of use) and daily or almost daily (26-30 days of use). The majority of women (87%) used nicotine daily or almost daily. The variable, months of daily use of cigarettes in lifetime, was left unchanged because the data was normally distributed. On average, women had smoked 135 months or about 11 years in their lifetime. Finally, the variable, typical number of cigarettes smoked per day in past the 30 days, was dichotomized into smoked less than a pack of cigarettes per day and smoked a pack of cigarettes or more daily (a pack is equal to 20 cigarettes). About two-fifths (38%) of the sample reported smoking a pack of cigarettes or more a day.

Heroin and cocaine variables were also adjusted in a manner similar to nicotine variables to address non-normal distributions. Number of days used heroin/cocaine in past 30 days was changed to type of use in past 30 days and re-coded as non-regular use (less than 12 days of use) and regular use (12 or more days of use). This categorization and definition of regular use was used to remain consistent with the ASI's definition of regular use. Eighty-six percent of the sample used heroin regularly in the past 30 days, while 57% of the sample used cocaine regularly. The variable, months of regular use of heroin/cocaine in lifetime, was also changed to remain consistent with the ASI. Although, in this study the unit of time was months, the ASI 5th Edition records the years the regular

use. Using years instead of months was a change made between the 3rd and 5th Editions and thus substance use was rounded to the nearest full year (McLellan et al., 1992). Consequently, cases with values less than 12 were coded as missing for months of heroin use (n= 17) and cocaine (n = 53). Following removal of these cases, both variables were non-normally distributed so a median split was preformed to dichotomize data. For heroin, this split occurred at 70 months (5.8 years; 49.8th percentile) and for cocaine, at 48 months or 4 years (51.5th percentile). Typical amount of heroin/cocaine used in US\$ in the past 30 days was another variable used to characterize heroin/cocaine use severity. For both substances, the variable was non-normally distributed, so data was divided into categories of small, medium, and large amounts. Values for each category were derived by examining frequencies and setting cut-offs closest to the 33rd and 66th percentiles in order to assign approximately equal numbers of participants to each category. For typical amount of heroin used in past 30 days, a small amount represented \$0-30, medium \$31-70, and a large amount was considered \$71 or more of heroin. For typical amount of cocaine used in past 30 days, a small amount ranged from \$0-15, medium \$16-45, and a large amount represented \$46 or more of cocaine. See Table 3 for exact frequencies.

Two variables which considered use of all drugs were used to further define substance use severity: days in the past 30 experienced drug problems and Interviewer Severity Rating for drug problems (scored on a 10-point scale from 0-9). The variable, days in the past 30 experienced drug problems, was changed to frequency of drug problems in the past 30 days and dichotomized into categories of less than daily (drug problems experienced 0-29 days) and daily (experienced drug problems every day in past

30). About three quarters (74%) of the women experienced drug problems daily.

Interviewer Severity Rating for drug problems was left unchanged and on average, women received a rating of 6 which indicated a considerable problem and that treatment was necessary.

Psychiatric severity items from the ASI were also left changed, with the exception of the Interviewer Severity Rating for psychiatric problems, because responses were already dichotomized as no/yes responses. Descriptive analyses supported the incidence of psychiatric problems in this sample (see Table 4). Two-fifths of the sample reported experiencing some symptoms of depression for a significant period in their lifetime, while one-fifth reported experiencing symptoms of an anxiety disorder for a significant period in their lifetime. More than a third of the sample (37%) experienced psychological/emotional problems within the past 30 days. Forty-one percent of the women had experienced serious thoughts of suicide in their lifetime, meaning that they had seriously considered a plan for taking their own life, and about a quarter (24%) of the sample had actually attempted suicide. About a third (32%) of the sample had received some form of psychiatric or psychological treatment in their lifetime, either inpatient or outpatient, for psychological/emotional problems. The Interviewer Severity Rating for psychiatric problems was dichotomized into categories that represented need for psychological treatment (scores of 4-9) or not (scores of 0-3). Most women (69%) did not require psychological treatment, as indicated by their Interviewer Severity Rating for psychiatric problems.

Primary Analyses

Further analysis was conducted to address the additional aims of this study and their corresponding hypotheses. Each severity variable (see Table 1) was examined by density of parental alcohol problems (0, 1 or both parents affected by alcohol problems) and by density of parental drug problems (0, 1 or both parents affected by drug problems). For both types of parental densities, alcohol problems (Hypothesis 1) and drug problems (Hypothesis 2), a dose-response relationship was hypothesized such that women with neither parent affected will have the lowest severity problems, followed by those with one parent affected, and finally those with both parents having problems. If any support for this hypothesis was found, the relationship was further examined by considering paternal and maternal history of problems separately. It was hypothesized that women with a positive history (e.g., having a father with alcohol problems, having a mother with drug problems) will present with more severe substance abuse and psychiatric symptoms than probands without such history (Hypotheses 3 and 4). Results of analyses to test these hypotheses are explained below for each type of severity variable.

Severity of Alcohol Use. To examine the relationship between parental density of alcohol problems and alcohol use severity, a standard logistic regression was used to determine if parental density of alcohol problems predicted whether or not a woman was ever diagnosed with alcohol abuse or dependence in her lifetime. Compared to a constant-only model, the parental density of alcohol problems did not significantly distinguish between a diagnosis of alcohol abuse or dependence or no diagnosis, $\chi^2(2) = 1.74, p > .05$. In addition, a one-way ANOVA was conducted to explore the impact parental density of

alcohol problems on age of first use of alcohol. There was no significant difference in age of first use of alcohol between levels of parental alcohol density, $F(2,200) = 1.91, p > .05$. Results of these analyses do not support a dose response relationship with regard to density of parental alcohol problems and severity of alcohol use, as predicted in Hypothesis 1. Consequently, parental alcohol problems were not further examined by type of parent.

To examine the relationship between parental density of drug problems and alcohol use severity, a standard logistic regression was used to determine if parental density of drug problems predicted whether or not a woman was ever diagnosed with alcohol abuse or dependence in her lifetime. Compared to a constant-only model, the parental density of drug problems did not significantly distinguish between a diagnosis of alcohol abuse or dependence or no diagnosis, $\chi^2(2) = 2.73, p > .05$. In addition, a one-way ANOVA was conducted to explore the impact of parental density of drug problems on age of first use of alcohol. There was no significant difference in age of first use of alcohol between levels of parental drug density, $F(2,200) = .25, p > .05$. Results of these analyses do not support a dose response relationship with regard to density of parental drug problems and severity of alcohol use, as predicted in Hypothesis 2. As a result, no further examination of parental drug problems by type parent was conducted.

Severity of Heroin Use. Logistic regression was used to examine categorical variables representing severity of heroin use. For type of heroin use in the past 30 days, a standard logistic regression analysis was used to test the full model with parental alcohol density included against a constant-only model. Parental density did not reliably distinguish whether a woman used heroin regularly (12 or more times) in the past 30 days,

$\chi^2(2) = .28, p > .05$. Similarly, parental density of drug problems did not reliably distinguish regular use in the past 30 days, $\chi^2(2) = .13, p > .05$. These results do not support Hypothesis 1 or 2 for heroin severity, as measured by type of use in past 30 days. For history of regular heroin use, a standard logistic regression analysis was used to test the full model with parental alcohol density included against a constant-only model. Parental alcohol density did not reliably distinguish whether a woman had a longer history of regular heroin use or not, $\chi^2(2) = .546, p > .05$. Likewise, parental density of drug problems did not reliably distinguish whether a woman had a longer history of regular cocaine use or not, $\chi^2(2) = .009, p > .05$. Thus, results do not support Hypothesis 1 or 2 for heroin severity, as measured by a longer history or regular use.

For typical amount used daily in the past 30 days, an ordinal regression analysis, PLUM (Polytomous Universal Model), was used to determine if density of parental alcohol problems significantly predicted the amount of heroin used on a typical day in past 30 (small \$0-30, medium, \$31-70, and large \$71+). Neither parental density of alcohol problems ($\chi^2(2) = .20, p > .05$) or parental density of drug problems ($\chi^2(2) = 1.22, p > .05$) significantly distinguished the amount of heroin used daily. These results do not support the notion of a dose-response relationship between the densities of parental alcohol problems (Hypothesis 1) and parental drug problems (Hypothesis 2) and cocaine severity.

One-way ANOVAs were conducted to determine if parental density significantly affected age of first use of heroin. No significant differences in age of first use of heroin between levels of parental density of alcohol problems were found, $F(2,256) = .14, p > .05$ and thus Hypothesis 1 was not supported. However, a different relationship was observed

for parental density of drug problems. There was a significant effect of density of parental drug problems on age of first use of heroin, $F(2, 256) = 4.75, p < .01$. Post-hoc comparisons using the Tukey-HSD test indicated that women with two parents with drug problems ($M = 18.13, SD = 3.47$) began drug use at an earlier age than women with parents with no drug problems ($M = 20.91, SD = 4.61$; see table 5). Partial support for Hypothesis 2 was provided, as women with two parents with drug problems had more severe heroin use, as measured by age of first use, than women with no parents with the disorder.

Table 5

Mean Differences in Age of First Use of Heroin and Cocaine for Women with Two and No Parents with Drug Problems

Substance	Number of parents	Mean age	<i>p</i> value
Heroin	0	20.91	.011
	2	18.13	
Cocaine	0	21.87	.002
	2	18.68	

Parental history of drug problems was further examined to test whether women with a paternal history of drug problems were more likely to have more severe heroin use, as measured by age of first self-initiated use, than probands without such history (Hypothesis 3) and also whether women with a maternal history of drug problems were more likely to have more severe heroin use, as measured by age of first self-initiated use, than probands without such history (Hypothesis 4). Standard multiple regression, with the

variables, paternal drug problems and maternal drug problems, as predictors was used to tests these hypotheses. The full model, with both predictors, compared to a constant-only model was significant, $F(2, 254) = 4.76, p < .01$, and accounted for 3.6% of the variance in age of first self-initiated use of heroin. Paternal drug problems was not a significant predictor in the model, $t(254) = -1.61, p > .05$ and so Hypothesis 3 was not supported. In support of Hypothesis 4, having a mother with drug problems was significantly associated with a younger age of first use, $t(254) = -2.22, p < .05$.

Severity of Cocaine Use. Logistic regression was used to examine categorical variables representing severity of cocaine use. For type of cocaine use in the past 30 days, a standard logistic regression analysis was used to test the full model with parental alcohol density included against a constant-only model. Parental density did not reliably distinguish whether a woman used cocaine regularly (12 or more times) in the past 30 days, $\chi^2(2) = 2.62, p > .05$. Similarly, parental density did not reliably distinguish regular use in the past 30 days either, $\chi^2(2) = .05, p > .05$. These results do not support Hypothesis 1 or 2 for cocaine severity, as measured by type of use in past 30 days. For history of regular use, a standard logistic regression analysis was used to test the full model with parental alcohol density included against a constant-only model. Parental alcohol density did not reliably distinguish whether a woman had a longer history of regular cocaine use or not, $\chi^2(2) = 1.09, p > .05$. In addition, parental density of drug problems did not reliably distinguish whether a woman had a longer history of regular cocaine use or not, $\chi^2(2) = .20, p > .05$. Thus, results do not support Hypothesis 1 or 2 for cocaine severity, as measured by a shorter or longer history or regular use.

For typical amount used daily in the past 30 days, an ordinal regression analysis (PLUM) was used to determine if density of parental alcohol problems significantly predicted the amount of cocaine used on a typical day in past 30 (small \$0-15, medium, \$16-45, and large \$46+). Neither parental density of alcohol problems ($\chi^2(2) = 3.70, p > .05$) or parental density of drug problems ($\chi^2(2) = 2.18, p > .05$) significantly distinguished the amount of cocaine used daily. These results do not support the notion of a dose-response relationship between the densities of parental alcohol problems (Hypothesis 1) and parental drug problems (Hypothesis 2) and cocaine severity.

One-way ANOVAs were conducted to determine if parental density significantly affected age of first self-initiated use of cocaine. There was no significant difference in age of first cocaine use by level of parental density of alcohol problems, $F(2, 256) = 2.49, p > .05$ and thus Hypothesis 1 was not supported. However, a different relationship was observed for parental density of drug problems. There was a significant effect of density of parental drug problems on age of first use of cocaine, $F(2, 79.02) = 11.26, p > .001$. Analysis using parental density of drug problems indicated that the assumption of homogeneity of variance was violated; therefore, the Welch F -ratio was reported. Post hoc comparisons using the Tukey HSD test indicated that the mean age of first use for women with two parents with the disorder ($M = 18.68, SD = 2.78$) was significantly different from the mean age of women with no parents with drug problems ($M = 21.86, SD = 4.64$; see Table 5). Women with two parents affected first used cocaine at an earlier age than women with no parents affected. Although not significant, the difference between women with two parents with drug problems and women with one parent ($M = 20.83, SD = 4.08$)

approached significance, $p = .08$. Some support for Hypothesis 2 was provided, as women with two parents with drug problems had more severe cocaine use, as measured by age of first use, than women with no parents with the disorder.

Parental history of drug problems was further examined to test whether women with a paternal history of drug problems were more likely to have more severe cocaine use, as measured by age of first self-initiated use, than probands without such history (Hypothesis 3) and also whether women with a maternal history of drug problems were more likely to have more severe cocaine use than probands without such history (Hypothesis 4). Standard multiple regression analyses with the variables of paternal drug problems and maternal drug problems as predictors were used to test these hypotheses. The full model, with both predictors, compared to a constant-only model was significant, $F(2, 256) = 6.07, p < .005$, and accounted for 4.5% of the variance in age of first self-initiated cocaine use. In support of Hypothesis 3, having a father with drug problems was significantly associated with a younger age of first use, $t(256) = -2.04, p < .05$. In support of Hypothesis 4, having a mother with drug problems was significantly associated with a younger age of first use, $t(256) = -2.29, p < .05$.

Severity of Nicotine Use. Logistic regression was used to examine categorical variables representing severity of nicotine use, specifically whether parental density significantly predicted severity of nicotine use. For type of nicotine use in the past 30 days, a standard logistic regression analysis was used to test the full model with parental alcohol density included against a constant-only model. The ability of parental density of alcohol problems to predict whether a woman used nicotine daily in the past 30 days

approached statistical significance, $\chi^2(2) = 5.87, p = .053$. However, parental density of drug problems did not reliably distinguish whether a woman smoked almost never or daily, $\chi^2(2) = 2.99, p > .05$. These results do not support Hypothesis 1 or 2 for nicotine severity, as measured by type of use in past 30 days. For typical number of cigarettes smoked per day in past the 30 days, a standard logistic regression analysis was used to determine if parental history was a significant predictor of whether a woman smoked a pack or more of cigarettes daily or not. Neither parental density of alcohol problems ($\chi^2(2) = .80, p > .05$) or parental density of drug problems ($\chi^2(2) = 2.71, p > .05$) was a significant predictor. Again, these results do not support Hypothesis 1 or 2 for nicotine severity, as measured by typical number of cigarettes smoked per day.

Logistic regression was also used to determine whether parental density significantly predicted an earlier age of first use of nicotine (during pre-teenage years) versus a later age of first use (teenage years or later). A test of the full model with parental density of alcohol problems included against a constant –only model was statistically significant, $\chi^2(2) = 6.19, p = .045$. The effect size of parental alcohol density was small, with Cox and Snell R-square = .026 and Nagelkerke R-square = .041. According to the Wald criterion, having no parents with alcohol problems compared to both parents was a significant predictor of time of first use of nicotine, $\chi^2(1) = 5.88, p < .05$. The odds of women with no affected parents were .31 the odds of a woman with two affected parents beginning nicotine use during their pre-teenage years (see Table 6). These results support Hypothesis 1 in that women with no parents with alcohol problems were less likely than women with two parents with the disorder to evidence more severe nicotine use, as

measured by beginning use younger. Further analysis of parental density of alcohol problems revealed that considering parental problems separately did not significantly predict whether a woman began nicotine use during her pre-teenage years or not. A test of the full model with paternal alcohol problems and maternal alcohol problems included against a constant –only model was not statistically significant, $\chi^2(2) = 4.81, p > .05$. These results do not support either Hypothesis 3 or 4.

Table 6

Predicting First Use of Nicotine during Pre-teenage Years from Density of Parental Alcohol Problems

Type of Parental Density Comparison	Exp(B)
0 versus 2	.313*
1 versus 2	.565

* $p < .05$

Logistic regression was used to determine whether parental density of drug problems significantly predicted an earlier age of first use of nicotine (pre-teenage years) versus a later age of first use (teenage years or later). Parental density did not reliably distinguish whether a woman first used nicotine during her pre-teenage years, $\chi^2(2) = 4.85, p = .09$ and so Hypothesis 2 was not supported.

An analysis of covariance (ANCOVA) was used to determine if parental density of alcohol problems affected the number of months a woman smoked daily in her lifetime, while controlling for the effect of age. There was a significant effect of parental density of alcohol problems on number of months of daily smoking, controlling for the effect of age,

$F(2, 256) = 3.18, p < .05$; however, a partial eta square of .024 suggested this relationship was weak. Pairwise comparisons using age-adjusted means and a Bonferroni correction for multiple comparisons revealed that having two parents with alcohol problems was associated with significantly greater months of daily smoking compared to having one parent ($p > .05$); see Table 7). Adjusted means of having neither parent with alcohol problems compared to either one ($p > .05$) or two ($p > .05$) parents with alcohol problems were not significantly different.

Table 7

Mean Difference in Months of Daily Smoking for Women with Two and One Parent(s) with Alcohol Problems Controlling for Age

Number of parents	Mean age in months(years)	<i>p</i> value
1	126 (10.5)	.039
2	155 (12.92)	

Parental history of alcohol problems was further examined to test whether women with a paternal history of alcohol problems were more likely to have more severe nicotine use, as measured by months of daily smoking in lifetime, than probands without such history (Hypothesis 3) and also whether women with a maternal history of alcohol problems were more likely to have more severe cocaine use, as measured by months of daily smoking in lifetime, than probands without such history (Hypothesis 4). Hierarchical multiple regression was used in order to determine whether paternal and maternal alcohol problems significantly contributed, above and beyond age, to the prediction of months of

daily nicotine. Model 2, which included paternal alcohol problems, maternal alcohol problems, and age, compared to Model 1, significantly predicted months of nicotine use, $F(3, 256) = 74.93, p < .001$. However, including paternal and maternal history in the model did not account for significantly more variance explained than including only age as a predictor, $F(2, 256) = 2.10, p > .05$. Paternal alcohol problems was not a significant predictor in the model, $t(256) = -.695, p > .05$. In support of Hypothesis 4, having a mother with alcohol problems was significantly associated with increased months of daily smoking, $t(254) = -2.02, p < .05$.

An additional analysis of covariance (ANCOVA) was used to determine if parental density of drug problems affected the number of months a woman smoked daily in her lifetime, while controlling for the effect of age. When parental density was examined, there was no significant effect on number of months of daily smoking, even after controlling for the effect of age, $F(2, 256) = 2.54, p > .05$. These results fail to support Hypothesis 2.

Drug Problem Severity. Hypotheses were also evaluated for variables of combined drug severity. Non-specific drug severity variables and parental density of substance problems were examined using logistic regression and one-way ANOVA. Neither parental density of alcohol problems ($\chi^2(2) = 3.31, p > .05$) nor parental density of drug problems ($\chi^2(2) = 1.63, p > .05$) significantly predicted whether a woman experienced drug problems everyday in the past 30 days or not. Similarly, interviewer severity ratings of drug severity were not affected by density of parental alcohol problems ($F(2, 257) = .53, p$

> .05) or density of parental drug problems ($F(2, 257) = .14, p > .05$). None of these findings lend support to either Hypothesis 1 or 2.

Psychiatric Severity. Logistic regression was used to evaluate whether parental density of alcohol problems (Hypothesis 1) and parental density of drug problems (Hypothesis 2) significant predicted psychiatric severity, as measured by classification to a more severe psychiatric category (e.g., experiencing symptoms of depression in lifetime vs. not). These analyses indicated that parental density of alcohol problems was not a significant predictor of any of psychiatric severity variables ($p > .05$) and Hypothesis 1 was not supported. The ability of parental density of drug problems to significantly predict psychiatric severity differed depending on the variable of interest, providing partial support for Hypothesis 2 (see Table 8).

Table 8

Predicting Psychiatric Severity from Parental Density when Comparing Women with One versus No Parents with Drug Problems

Psychiatric variable	Exp(B)
Experienced serious depression-sadness, hopelessness, loss of interest for a significant period of time in lifetime	2.79**
Experienced serious thoughts of suicide/seriously considered a plan for taking one's life in lifetime	2.17**
Attempted suicide	2.21*
Received treatment (inpatient and/or outpatient) for any	2.19**

psychological/emotional problems in lifetime	
Interviewer Severity Rating for psychiatric problems indicated treatment needed	1.89*

* $p < .05$

** $p < .01$

Parental density of drug problems was not found to significantly predict whether or not a woman experienced symptoms of an anxiety disorder or not in her lifetime, $\chi^2(2) = 4.07, p > .05$ or whether or not whether she had experienced any psychological/emotional problems in past 30 days, $\chi^2(2) = 3.88, p > .05$. However, parental density of drug problems was able to distinguish whether or not a woman experienced other indicators of psychological problems.

For the variable, experienced symptoms of clinical depression in lifetime, parental density of drug problems included against a constant –only model was statistically significant, $\chi^2(2) = 13.90, p > .005$. However, the effect size of parental drug density was small, with Cox and Snell R-square = .052 and Nagelkerke R-square = .007. According to the Wald criterion, having one parent with drug problems compared to no parents was a significant predictor of whether a woman reported depression symptoms in her lifetime or not, $\chi^2(1) = 12.86, p < .001$. Women with one parent affected were 2.79 times more likely to report having experienced depression symptoms than women with no parents affected by alcohol problems.

Parental density of drug problems was further examined by analyzing whether paternal and maternal problems individually predicted whether a woman experienced

symptoms of depression in her lifetime. When both history of paternal drug problems and history of maternal drug problems were included as predictors in the model and compared against a constant –only model, the difference was statistically significant, $\chi^2(2) = 9.56, p < .01$. Effect sizes were small (Cox and Snell R-square = .036 and Nagelkerke R-square = .049). According to the Wald criterion, having a father with drug problems compared no paternal history of drug problems was a significant predictor of whether a woman ever experienced symptoms of depression, $\chi^2(1) = 4.61, p < .05$. Women with a paternal history of drug abuse were 1.82 times more likely to have experienced symptoms of depression in their lifetime than women with a father who did not have drug problems. These results support that women with a history of paternal drug problems were more likely than those who do not to experience more severe psychiatric problems (Hypothesis 3), but not that women with a maternal history experience any more severe of problems than women with no such history (Hypothesis 4).

For the variable, experienced thoughts of suicide in lifetime, parental density of drug problems included against a constant –only model was statistically significant, $\chi^2(2) = 8.94, p < .05$. The effect size of parental drug density was again small, with Cox and Snell R-square = .034 and Nagelkerke R-square = .046. According to the Wald criterion, having one parent with drug problems compared to no parents was a significant predictor of whether a woman reported thoughts of suicide in her lifetime or not, $\chi^2(1) = 7.55, p < .01$. Women with one parent affected were 2.17 times more likely to report having experienced thoughts of suicide than women with no parents affected by drug problems. To test Hypotheses 3 and 4, history of paternal drug problems and history of maternal drug

problems were included as predictors in a logistic regression model and compared against a constant –only model. The difference in the two models was statistically significant, $\chi^2(2) = 8.27, p < .05$. Effect sizes were small (Cox and Snell R-square = .031 and Nagelkerke R-square = .042). Having a paternal history of drug problems compared to having a father with no history was not a significant predictor and thus, Hypothesis 3 was not supported. Women with a mother with drug abuse were significantly more likely to have experienced thoughts of suicide in their lifetime than women with a mother who did not have drug problems, $\chi^2(1) = 5.34, p < .05$, OR = 2.19. These results provide support for Hypothesis 4.

As would be expected given the previous findings, for the variable, attempted suicide in lifetime, parental density of drug problems included against a constant –only model was statistically significant, $\chi^2(2) = 6.20, p < .05$. The effect size of parental drug density was small, with Cox and Snell R-square = .024 and Nagelkerke R-square = .036. According to the Wald criterion, having one parent with drug problems compared to no parents was a significant predictor of whether a woman ever attempted suicide or not, $\chi^2(1) = 6.27, p < .05$. Women with one parent affected were 2.21 times more likely to have attempted suicide than women with no parents affected by drug problems. However, further analysis revealed that considering parental drug problems separately did not significantly predict whether a woman ever attempted suicide. A test of the full model with paternal drug problems and maternal drug problems included against a constant –only model was not statistically significant, $\chi^2(2) = 3.90, p > .05$. These results do not support either Hypothesis 3 or 4.

Parental drug problems was also a significant predictor of whether a woman received outpatient and/or inpatient treatment at some point in her life for psychological problems, $\chi^2(2) = 7.33, p < .05$. However, the effect size was again rather small, with Cox and Snell R-square = .028 and Nagelkerke R-square = .039. According to the Wald criterion, having one parent with drug problems compared to no parents was a significant predictor of whether a woman ever received treatment for psychological problems or not, $\chi^2(1) = 7.19, p < .01$. Women with one parent with drug problems were 2.19 times more likely to have received treatment for psychological problems than women with no parents affected by drug problems. Further examination of parental density of drug problems did not support either Hypothesis 3 or 4. When paternal and maternal drug problems were included against a constant –only model, the contribution of these predictors was not statistically significant, $\chi^2(2) = 2.44, p > .05$.

Similar results were observed for interviewer severity rating of psychological problems in regard to density of parental drug problems. A test of the full model with parental density included against a constant –only model was statistically significant, $\chi^2(2) = 6.71, p < .05$. The effect size of parental drug density was small, with Cox and Snell R-square = .025 and Nagelkerke R-square = .036. According to the Wald criterion, having one parent with drug problems compared to no parents was a significant predictor of whether the woman's psychiatric severity rating indicated psychological treatment, $\chi^2(1) = 4.60, p < .05$. Women with one parent affected were almost two times more likely (OR = 1.89) to receive a severity rating that indicated the need for psychological treatment than women with no parents affected by drug problems. A trend was observed in comparing

women with two affected parents to women with no affected parents, with the latter being more likely to receive a severity rating indicating psychological treatment than the former, $\chi^2(1) = 3.19, p = .051, OR = 2.38$.

To test Hypotheses 3 and 4 with whether a woman's Interviewer Severity Rating for psychiatric treatment indicated psychological treatment, history of paternal drug problems and history of maternal drug problems were included as predictors in a logistic regression model and compared against a constant –only model. The difference in the two models was statistically significant, $\chi^2(2) = 6.84, p < .05$. Effect sizes were small (Cox and Snell R-square = .026 and Nagelkerke R-square = .037). Having a paternal history of drug problems compared to having a father with no history was not a significant predictor and thus, Hypothesis 3 was not supported. Women with a mother with drug abuse were significantly more likely to have a rating that indicated psychological treatment than women with a mother who did not have drug problems, $\chi^2(1) = 4.19, p < .05, OR = 2.02$. These results provide support for Hypothesis 4.

Discussion

The purpose of the proposed study was to examine the relationship between history of parental substance abuse and both substance use and psychiatric severity measures in a sample of treatment-seeking, pregnant women who meet DSM-III-R criteria for lifetime opioid and cocaine abuse/dependence. This relationship was studied by separately examining parental density of alcohol problems and parental density of drug problems. When significant relationships were found, the study further assessed the relationship between history of parental problems and substance use and psychiatric severity at the level of the individual parent (i.e., presence of maternal and paternal problems).

Summary of Findings

Prevalence of Parental Alcohol and Drug Problems. This study documented rates of family history of substance abuse in a sample of pregnant, drug dependent, and treatment-seeking women. Family history was described in terms of maternal, paternal, and parental (considering both parents' problems) alcohol and drug problems. The present study found 32% of the women's fathers had alcohol problems (but no drug problems), compared to 13% of the women's mothers. Drug problems only were less prevalent with 14% of the fathers and 12% of the mothers having problems. When alcohol and drug use were combined, the majority of women (71%) reported some kind of substance problems in their biological parents.

Prevalence of Substance Use and Psychiatric Problems. Although all women met criteria for lifetime opioid and cocaine abuse and/or dependence, prevalence rates of substance use and severity for alcohol, heroin, cocaine, and nicotine were described for this sample, as well as rates of psychiatric problems. High rates of current and lifetime illicit drug use, quantity typically used, and accompanying problems confirm the severity of illicit drug use in this sample. In addition, high rates of current and lifetime nicotine use and quantity typically consumed indicated that nicotine was also a common drug of abuse for these women. Current and lifetime alcohol use was rather low in the sample compared to rates of use for other drugs. The frequency of women experiencing psychiatric problems, both recently and throughout their lifetime, reflected a history of psychological problems and for some women, current problems.

Density of Parental Problems and Substance Use and Psychiatric Severity. Several differences were found in proband substance use and psychiatric comorbidity measures as a function of density of parental substance abuse. Different patterns were seen for density of parental alcohol problems and density of parental drug problems. Of For alcohol problems, no dose-response relationships were found in which severity of the variable increased as a function of parental density (0 vs. 1 vs. 2 parents). However, parental density of alcohol problems were related to two nicotine variables, age of first self-initiated use and number months of daily smoking in lifetime. Women with no parents with the disorder were less likely than those with two parents to initiate cigarette use during their pre-teenage years. Having two parents with alcohol problems was associated with greater months of daily nicotine use compared to having one parent with problems.

When the same variables were examined as a function of parental density of drug problems, as with alcohol, no dose-response relationships were seen. However, in contrast to alcohol, a larger number of variables did show group differences between either two parents and one parent or one parent and no parents. Density of drug problems was associated with heroin and cocaine severity, specifically age of first self-initiated use, and indicators of psychiatric severity, related to depression and overall psychiatric severity. For both age of first use of heroin and cocaine, having two parents with drug problems compared to no parents was associated with an earlier age of first use. On average, women with two parents with drug problems first initiated heroin and cocaine use approximately three years earlier than women who had no parents with drug problems. Although not significantly significant, women with one parent with drug problems first used heroin and cocaine earlier than women with no parents but later than women with two parents with the disorder. Density of parental drug problems was also associated with psychiatric problems, including experiencing symptoms of depression in lifetime, experiencing serious thoughts of suicide in lifetime, attempting suicide, receiving treatment for psychological problems, and receiving an Interviewer Severity Rating that warranted treatment for psychological problems. Women with one parent with drug problem were at least 1.9 times more likely than women with no parents to report the psychological problems mentioned above.

Neither parental density of alcohol problems nor drug problems was associated with more severe alcohol problems or overall drug problems, as measured by number of

days experienced drug problems in past month and Interviewer Severity Rating for drug problems.

Parental History of Problems by Type of Parent. When parental density of problems was further examined by looking at paternal (having a father with problems vs. not) and maternal (having a mother with problems vs. not) problems separately, mixed results were found between type of parental problems and severity of substance use and psychiatric problems. This was true for history of parental alcohol problems. For the relationship between parental alcohol problems and beginning nicotine use during pre-teenage years, neither maternal or paternal problems was significant in predicting whether a woman first used nicotine before the age of 13. However, having a mother with alcohol problems, but not a father, was a significant predictor of months of daily use in lifetime, above the predictive ability of age. Together, these findings provide some support for the hypothesis that women with a positive maternal alcohol history will be more likely to have more severe alcohol problems.

Mixed support was also found for Hypothesis 3 and 4 regarding paternal and maternal drug problems. For age of first-initiated heroin use, having a father with drug problems, but not a mother with the same problems, significantly predicted an earlier age of first use. For age of first-initiated cocaine use, having a father with drug problems and a mother with drug problems significantly predicted an earlier age of first use. Predicting psychiatric problems by paternal drug problems and maternal drug problems also produced inconsistent support for Hypotheses 3 and 4. Having a father with drug problems significantly predicted whether a woman reported symptoms of depression in her lifetime,

while having a mother with these problems did not. In contrast, having a mother with drug problems significantly predicted whether a woman had ever experienced serious thoughts of suicide, while having a father with these same problems did not. However, maternal problems did not remain a significant predictor when whether a woman had ever attempted suicide was considered. Having a father with drug problems did not significantly predict attempting suicide either. Neither having a father with drug problems nor having a mother with drug problems significantly predicted whether or not a woman had ever received treatment for psychological problems in her lifetime. Finally, having a positive maternal history of drug problems significantly predicted a woman receiving an Interviewer Severity Rating that warranted psychological treatment. A positive paternal history did not significantly predict type of rating.

Discussion of Findings

Prevalence of Parental Alcohol and Drug Problems. The idea that substance use disorders tend to run in families is supported by the current study. When considering only the biological father and mother, a family history of substance abuse was observed in over 70% of the study's participants. Prevalence rates also distinguished between different types of problems, alcohol only, drug only, and alcohol and drug, experienced by the mother, father, or among both parents. This description of parental history is noteworthy because it presents a much clearer picture of family history than simply reporting frequencies of having a mother/father with alcohol/drug problems.

Compared to a mixed gender sample of opioid-dependent individuals seeking outpatient treatment and living in the same geographic region (Pickens et al., 2001), drug-

dependent pregnant women in the current study reported comparable rates of alcohol problems in mothers (18.5% vs. 16.6%) and fathers (49% vs. 47%) but much higher rates of drug problems in mothers (17.7% vs. 3.9%) and fathers (32% vs. 8.8%). Combined rates of alcohol and/or drug problems in mothers (30.8% vs. 18.3%) and fathers (70.9% vs. 50.2%) were also much higher in the pregnant sample. The study by Pickens and colleagues (2001) did not report rates of parental problems by participants' gender so direct comparison of the women in their sample and the women in this study cannot be made. Differences in the prevalence of paternal and maternal substance use problems may reflect differences in the severity of substance problems between the two samples and suggest a greater incidence of family history of substance problems among more severe individuals. On the other hand, differences could also exist because males were included in the comparison study but not in the current study.

Prevalence of Substance Use and Psychiatric Problems. Given study participants were drug-dependent, treatment-seeking individuals, it is not surprising that the prevalence of alcohol and drug use was higher among this sample than the general population (SAMSHA, 2006). Most women had used heroin and cocaine regularly in the month before enrolling in treatment. Nicotine use was especially high among this drug-dependent sample, with 87.7% of the sample reporting nicotine use in the past 30 days compared to estimates of 29.6% in the general population. Specifically, among the women who smoked cigarettes in the past 30 days, most did so daily. These rates are particularly alarming given the numerous negative fetal and offspring outcomes, including spontaneous abortion, growth restriction, and long-term behavioral and psychiatric problems (Shea,

2008), associated with cigarette smoking during pregnancy. Despite severe drug use, most women had never been diagnosed with either alcohol abuse or dependence and few reported experiencing alcohol problems in the past 30 days. The prevalence of AUDs in this drug-dependent sample (27%) mirrored the prevalence in the general population according to the 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC; Hasin et al., 2007) data (30.3%) but was much higher than the prevalence reported using National Comorbidity Survey-Replication (13.2%; Kessler et al., 2005a) epidemiological data.

The prevalence of psychiatric problems was expected to be high as individuals with drug use disorders are at an increased risk of experiencing comorbid psychological problems (Compton et al., 2007). Over two-fifths of the women had experienced serious thoughts of suicide to the point of having a plan for taking one's life at some point in their lifetime and over half of these women had actually attempted suicide. These high rates support the severity of lifetime psychological problems in this sample; however, high rates of suicidal thoughts and attempts may also be a result of alcohol and/or drug-related problems. Lifetime suicidal thoughts and attempts were documented regardless of probands' alcohol and/or drug use, whereas lifetime depression and anxiety symptoms were only recorded if the probands' problems were not a direct result of alcohol/drug use.

Density of Parental Problems and Substance Use and Psychiatric Severity.

Overall, results do not support a dose-response relationship between density of parental problems and substance use and psychiatric severity. It is important, however, to evaluate these results with consideration of the type of sample used in the current study. This

sample utilized individuals with known substance dependence and whose problems were severe enough for them to continue to use during pregnancy and to be admitted to an intensive, inpatient treatment program. Thus, this research examined if there was a significant relationship between density of parental problems and severity of substance use and psychiatric problems despite already severe problems in a sample of drug dependent individuals. High rates of substance use and associated problems may have confounded efforts to examine these relationships and thus, the findings of minimal differences were not surprising. However, previous research has demonstrated that certain factors (i.e., comorbid alcohol dependence, comorbid post-traumatic stress disorder) still predict greater severity of psychopathology within individuals who already exhibit severe psychopathology (Miles et al., 2001b; Moylan et al., 2001).

Although a direct effect of density of parental problems on substance use and psychiatric severity was not supported (greater severity with 2 vs. 1 vs. 0 parents with problems), some differences in severity were seen between different levels and types of parental density. Not surprisingly, low effect sizes for parental density were observed.

Density of parental alcohol problems was related to indicators of nicotine use, specifically age of first self-initiated use and months of daily smoking, but not heroin or cocaine use. The opposite relationship was seen for density of parental drug problems, with significant relationships observed only for age of first use of heroin and cocaine. Relationships between parental alcohol problems and nicotine, two licit substances, and parental drug problems and heroin and cocaine use, both illicit substances, support the

notion that familial transmission of substance use problems may be substance specific, specifically class of substance specific (licit vs. illicit).

Using a sample of alcohol dependent individuals and drug dependent individuals attending outpatient treatment, Merikangas and colleagues (1998b) found support for the association between the prominent substance use disorder in relatives and probands' substance use disorder. Alcohol use disorder was most common among probands with a family history of predominantly alcohol use disorder and opioid dependence was most common among probands with a family history of predominately opioid abuse/dependence. Other research examining risk of SUD disorders in individuals of parents with SUDs supports the pattern of familial transmission by type of substance (alcohol vs. drugs). Milberger and colleagues (1999), in a sample of adolescents with and without Attention-Deficit/Hyperactivity Disorder (ADHD), found that parental drug use disorder was not associated with an AUD in offspring, but parental alcohol use disorder was associated with AUD in offspring and also comorbid alcohol and drug use disorders in offspring. However, findings of this study were limited because of a small sample size of adolescents with only drug use disorder. Further research is needed to determine whether type of parental substance use disorder (alcohol vs. drug) affects probands' type of substance use disorder.

Differences in whether parental alcohol problems and parental drug problems affect severity of substance use and psychiatric problems could also be due to differences between alcohol and drugs. Some differences exist between alcohol and drugs, including differences in prevalence of use and misuse in the general population (SAMSHA, 2007)

and the risk of becoming dependent once substance use is initiated (Wagner & Anthony, 2007). The risk of becoming cocaine dependent was the greatest within the first year after the onset of use whereas the risk of becoming alcohol dependent was greatest 4-6 years after the first drink (Wagner & Anthony, 2007). Findings were based on epidemiological data from the original National Comorbidity Survey (NCS).

For all substances, with the exception of alcohol, parental density of problems was significantly associated with an earlier age of first self-initiated use. Parental density of alcohol problems did significantly predicted whether a woman first used nicotine before her teenage years, such that women with no parents with alcohol problems were less likely than women with two parents with alcohol problems to first use cigarettes before the age of 13. Parental density of drug problems was significantly associated with age of first use of heroin and cocaine. On average, women with two parents with drug problems first used heroin/cocaine almost three years earlier than women with only one parent.

Pickens and colleagues (2001), as previously described in the Family Method section of the Review of the Literature and in Prevalence of Parental Alcohol and Drug Problems of the current section, using the same measure to assess parental problems, compared age of first use between a mixed gender, treatment-seeking sample who were classified as family history positive (either parent reported alcohol and/or drug problems) and family history negative. They found a significant difference in age of first use of heroin but not cocaine between individuals who were considered family history positive and those who were family history negative. Interestingly, however, they also found that a

positive family history of alcohol problems was significantly associated with severity of lifetime heroin dependence, which was not supported in the present study.

Despite significant findings with regard to age of first self-initiated use and months of daily smoking, no other substance use severity indicators were significantly associated with density of parental substance problems. Further, the relationship between parental alcohol problems and offspring AUD, as observed in the literature (Kendler et al., 1997; Nurnberger et al., 2004), was not seen in the current study. Explanations for these findings are related to study limitations. Differences could be due to demographic characteristics as the present study included urban, African American women from a low socio-economic status whereas other research has focused on more heterogeneous samples. As previously mentioned, a higher severity of substance use and associated problems in this sample could have confounded the ability to observe an effect of parental density, especially as a lack of variability was observed among substance use variables.

Density of parental problems significantly predicted lifetime psychological problems and both lifetime and current treatment status. Specifically, this was true for parental density of drug problems and severity indicators related to depression (experiencing symptoms of depression for a significant period of time, suicidal thoughts, suicide attempt) and psychological treatment (receiving psychological treatment in the past or currently needing psychological treatment). In general, these findings are congruent with findings of similar studies examining parental history and offspring psychopathology (Pickens et al. 2001, Westermeyer et al., 2006). Westermeyer and colleagues found support for a significant dose-response relationship of parental problems and self-reported

psychiatric symptomatology; however, a psychiatrist-scored measure of depression was not significant. The authors did find a difference in frequency of reporting any lifetime psychiatric treatment by density of parental SUD. The finding that density of parental alcohol problems did not significantly predict psychiatric severity is contrary to what was hypothesized and supported in the literature (Dawson & Grant, 1998; Grant et al., 1996; Hill & Muka, 1996). In a study of the effect of parental substance use disorders on adolescents' personality, parental AUD was associated with greater negative emotionality, experiencing psychological distress and negative mood states in adolescents (Elkins et al., 2004).

Parental History of Problems by Type of Parent. Having a mother with drug problems did significantly predict a younger age of first use of both heroin and cocaine. However, no other consistent findings with regard to predicting substance use and psychiatric severity from whether or not a woman had a mother with alcohol/drug problems or whether she had a father with alcohol/drug problems emerged. Inconsistencies in parental history predicting psychiatric severity could be due to differences in the way psychological problems were assessed with regard to drug and alcohol problems. Responses related to symptoms of anxiety and depression were coded positively only if the problems were not a direct result of alcohol/drug use. Responses related to suicide were coded positively if they were experienced regardless of alcohol/drug use. This variability might have caused inconsistent findings.

Parental influence on offspring substance use and psychiatric severity may also vary as a function of environmental differences, specifically type of rearing environment.

Women could have been raised in a variety of different circumstances, including by both parents, only one parent, or by relatives. Census data indicates that the majority of African American children do not live with their biological fathers (U.S. Bureau of the Census, 2002). Consequently, mothers and fathers may exert a differential influence on their offspring as a result of their presence or lack of presence during childhood and early adulthood.

Study Implications, Future Directions, and Applications

The present study has a number of important implications. First, despite focusing on a very homogenous, severe sample of drug users, significant findings regarding parental history of substance abuse and proband substance use and psychiatric severity emerged. This suggests some role of parental history on substance use and psychological problems in drug-dependent pregnant women. Further research should be conducted to confirm the influence of parental problems within severe populations and also to determine whether the influence is more profound in less severe or non-clinical populations.

Another important implication of the current research is the use of information concerning parental alcohol and drug problems to inform treatment planning. This application supports the very reason family history information was added to the most current version of the ASI (McLellan et al., 1992). Given findings that women with two parents as opposed to no parents with drug problems begin heroin and cocaine use at an earlier age and an earlier age is often associated with more severe use and a poorer prognosis of the SUD (Sannibale & Hall, 2001; Babor et al., 1992), this information could be used to identify which women may need more intensive treatment. Further, number of

parents with alcohol problems could also be used to identify women who have a long history of daily smoking in their lifetime and who may benefit from nicotine replacement therapy (NRT). This treatment option may be safer than smoking during pregnancy, especially when women have unsuccessfully tried to quit (Coleman, 2007). Lastly, women who have a mother with drug problems may suggest the need for psychological treatment. These risk factors could be used to screen for at-risk women in such settings as Obstetric (OB) clinics and provide an opportunity for intervention. In addition to determining other risk factors for severe substance use and psychiatric problems, future investigations should examine whether, when used as screening questions, these risk factors successfully predict problematic substance use and psychiatric symptoms.

Study Limitations, Future Directions, and Strengths

The present study had a number of limitations. First, the sample included drug-dependent women who exhibited high levels of substance use and associated problems, as well as more severe psychiatric histories. Consequently, variability within these severity indicators was somewhat limited and could have interfered with the ability to observe a significant influence of density of parental problems. In addition, small sample sizes occurred when parental history was separated by both substance (alcohol versus drugs) and number of parents (0, 1, or 2). For example, only 12% ($n = 31$) of women had two parents with alcohol problems and 10% ($n = 26$) had two parents with drug problems. Small sample sizes also limited the study's power to observe significant findings. Thirdly, the study was limited by the historical time in which data were collected and thus, the

possibility of a cohort effect exists. The observed relationships may not exist for pregnant, drug-dependent women attending treatment at CAP today.

A fourth limitation was related to the generalizability of study findings to other populations. The sample was very homogenous (i.e., urban, African-American, drug-dependent, pregnant women of low SES in residential treatment) thus findings may not be generalizable to non-pregnant, Caucasian women of higher socio-economic status. Clearly, further research utilizing different types of individuals (e.g., non-treatment seeking women at risk for substance use, post-partum women) is needed to determine whether the results of the current study are applicable to different populations.

Another limitation of the current study was that family history was limited to focusing only on women's biological parents and did not consider substance abuse by siblings, grandparents, or other relatives. It is possible that substance abuse by other first- and second-degree relatives could have influenced the severity of women's substance use and psychiatric problems, especially if a woman was raised by a relative other than her parents. In the African American community, it is common for extended family members to play a significant role, whether indirect or direct, in child-rearing (Jones et al., 2007). Therefore, findings from the present study may not generalize to studies that define family history more broadly. In addition, the current study did not consider the type of relationship a woman had with her biological parents, whether she was raised by neither, one, or both of them, and thus differences could confound the relationship between parental density of problems and substance use and psychiatric severity. As previously mentioned, African American children are often come from single-mother families (U.S.

Bureau of the Census, 2002). Future studies focusing on parental history may benefit from asking whether an individual was raised by her biological parents or not in order to address this confound.

In addition, this study was limited by its use of the family history method, a type of methodology that cannot disentangle environmental from genetic influences. Therefore, conclusions cannot be made about *how* parental substance abuse affected probands' substance use and psychiatric severity. In addition, prenatal alcohol and/or drug exposure was not considered in the present study and should be considered a potential confound as this type of use has been shown to negatively impact the child (Jones, 2006).

This study also had methodological limitations. Both measures, the ASI and SCID, utilized self-report. Because women were assessed while in treatment for their drug dependence, it is unlikely that they under-reported their problems or minimized use. However, women may have presented their problems more severely as a "call for help" and/or to receive methadone. Thus, findings are limited to the women's self report of their substance use and problems. In addition, findings are also limited because of errors made by research assistants in administering the ASI. Despite quality assurance steps (e.g., specialized training, monthly case discussions), some items from the ASI were coded incorrectly and resulted in missing values. For example, age of first use of alcohol, heroin, cocaine, and nicotine all contained values of zero which indicated that the interviewer incorrectly included prenatal exposure to alcohol or drug, despite the intent of the question to measure age of first self-initiated use.

Another methodological limitation of the present study was that because the ASI family history questions do not distinguish between types of parental drug problems (e.g., cocaine problems versus marijuana problems) the study was not able to examine the relationship between parental history and substance use and psychiatric severity by specific type of drug. In order to examine the substance specificity of familial transmission of problems, additional research should distinguish the type(s) of drug abused by parents. Finally, results are limited to those who remained in treatment until the SCID was administered. The study only included women who completed both the ASI and SCID and the SCID was administered about three to four days after admission. As a result, women who had already left against medical advice (AMA) were not included in the study. Including those who left AMA could have produced different relationships as research with this sample has shown that women who leave early have greater family and psychiatric problems and fewer drug problems than women who complete the program (Kissin et al., 2004).

Despite these limitations, the study has important strengths. This study was the first to examine the relationship between density of parental substance problems, separately alcohol from drug problems, and both substance use and psychiatric severity. Doing so, adds new information to the literature as opposed to if the substances were combined. This research is also unique because it was conducted using a sample of individuals with severe substance dependence and despite their severity, relationships between parental history of alcohol/drug problems and severity of women's substance use and psychiatric problems were still observed.

A third strength of the study was that it identified risk factors for more severe substance use and psychiatric problems that could be used as screening questions to identify women who could benefit from treatment. Specifically, this type of information could be useful in non-treatment settings, such as an OB or primary care clinic, where at-risk women often go undetected. Another strength of the study was that it relied on commonly-used research and clinical assessment tools, the ASI and SCID, so the research could easily be replicated in different clinical and non-clinical samples.

In summary, results of the current study do not support a direct effect of density of parental problems on substance use and psychiatric severity (greater severity with 2 vs. 1 vs. 0 parents with problems); however, some differences in severity were seen between different levels and types of parental density. These differences were related to density of parental alcohol problems and nicotine use, including age of first self-initiated use and months of daily smoking in lifetime. Significant findings were also found in regard to density of parental drug problems and age of first use of illicit drugs, lifetime symptoms of depression, suicide, and past and current psychological treatment. The study also documented high rates of parental substance abuse among study participants. Results of this study should be interpreted with respect to the severity of substance use and psychiatric problems experienced by this sample. Additional research is needed to further examine whether parental substance abuse affects individuals' substance use and psychiatric symptomatology.

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